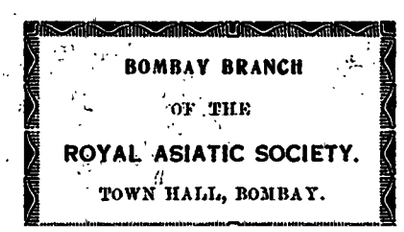
Agricultural Department,
Assam, Report
1916, 1917-18 to 1920-21



Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM

FOR THE

Year ending the 30th June

1916. & 1917-18

SHILLONG:

PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1916.

Price 9d]. [Price 8 annas.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM

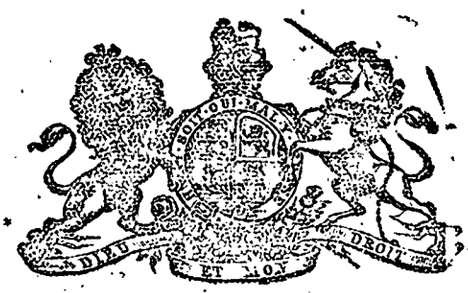
FOR THE

132906

Year ending the 30th June

1915-1916. & 1917-18 to 1920

4/3/1



00132906

SHILLONG:

PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1916.

Price 9d. [*Price 8 annas.*

Agents for the sale of Books published by the Assam Administration.

Agents in India.

(1) Messrs. Thacker, Spink & Co., Calcutta.

(2) Messrs. W. Newman & Co., Calcutta.

(3) Messrs. S. K. Lahiri & Co., Calcutta.

(4) Messrs. A. M. and J. Ferguson, Ceylon.

(5) Messrs. R. Cambray & Co., 6 and 8/2, Hastings Street Calcutta.

(6) Messrs. Thompson & Co., Madras.

(7) Babu Hari Ram Dhar, B.A. Popular Library, Dacca.

(8) Messrs. D. B. Taraporevala Sons & Co., 103 Meadon Street Fort, Post Box No. 187. Bombay.

(9) The Indian School Supply Depôt, 309, Bow Bazar Street, Calcutta.

(10) Messrs. M. C. Sircar & Sons, 75, Harison Road, Calcutta.

(11) Messrs. Students & Co., Cooch Bihar.

Agents in England.

(1) Messrs. Constable & Co., 10, Orange Street, Leicester Square, W. C.

(2) Messrs. Kegan Paul, Trench, Trübner & Co., 68—74, Carter Lane, E. C., London, Oriental Department, 25, Museum Street, London, W C.

(3) Mr. B. Quaritch, 11, Grafton Street, New Bond Street, W.

(4) Messrs. P. S. King & Son, 9, Bridge Street, Westminster, S. W., London.

(5) Mr. B .H. Blackwell, 50 and 51, Broad Street, Oxford.

(6) Messrs. Deighton Bell & Co., Limited, Cambridge.

(7) Messrs. Henry S. King & Co., 65, Cornhill, E. C., London.

(8) Messrs. Grindlay & Co., 54, Parliament Street, S. W. London.

(9) Messrs. W. Thacker & Co., 2, Creed Lane, London, E. C.

(10) Messrs. Luzac & Co., 46, Great Russell Street, London, W. C.

(11) Mr. J. Fisher Unwin, Limited 1 Adelphie Terrace, London W. C.

Agents on the Continent of Europe.

(1) M. Ernest Leroux, 28, Rue Bonaparte, Paris.

(2) Martinus Nijhoff, The Hague.

(3) Messrs. Olives and Boyd, Tweeddale Court, Edinburgh.

(4) Messrs. E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

SHILLONG:

PRINTED BY H. H. KING, PRESS SUPERINTENDENT, ASSAM.

No. IX-A.-5255.

FROM

A. R. EDWARDS, ESQ., B.A., I.C.S.,
DIRECTOR, DEPARTMENT OF LAND RECORDS
AND AGRICULTURE, ASSAM,

To

THE CHIEF SECRETARY TO THE CHIEF COMMISSIONER
OF ASSAM.

Shillong, the 14th September 1916.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1916.

I have the honour to be,

SIR,

Your most obedient Servant,

A. R. EDWARDS,

Director of Land Records and Agriculture, Assam.

[Prescribed maximum length—12 pages]

CONTENTS.

CHAPTER I.

ADMINISTRATION.

	Paras.
Director	1
Members of the Superior Staff	2
Subordinate establishment	3
Expenditure and receipts	4

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study in schools	5
Apprentices on Government Farms	6
Sabour Agricultural College	7

CHAPTER III.

EXPERIMENT AND RESEARCH.

Section I.—Agriculture.

Experiment Stations	8
Sugarcane	9
Sugarcane cultivation by steam tackle	10
Rice	11
Potatoes	12
Green manure crops	13
Fodder crops	14
Jute	15
Fruit	16
Section II.—Agricultural Chemistry	17
Section III.—Entomology	18

CHAPTER IV.

DISSEMINATION.

Section I.—Demonstration.

Localities	19
Rice	20
Sugarcane	21
Potatoes	22
Terrace cultivation	23
Fruits	24
Demonstrations by Honorary Correspondents	25

Section II.—Aid to the Public.

Fungus diseases	26
Seed supply	27

Section III.—Sericulture.

In the plains	28
In the Khasi Hills	29

Section IV.—Agricultural shows and Exhibitions.

Shillong Agricultural show	30

Section V.

Agricultural Associates and Honorary Correspondents	31

CHAPTER V.

OPERATIONS FOR THE IMPROVEMENT OF LIVE-STOCK.

	Paras.
Cattle breeding	32
Sheep breeding	33
Poultry breeding	34

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Agricultural publications	35
Supply of information	36

CHAPTER VII.

MISCELLANEOUS.

Weaving	37
Co-operative Societies and Agriculture	38
General progress	39
Notice of services	40
List of Honorary Correspondents and Associates	Appendix I.
Statement of receipts and expenditure	Appendix II.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending the 30th June 1916.

CHAPTER I.

ADMINISTRATION.

Director.

I held the post of Director of Land Records and Agriculture during the whole year and was on tour for 175 days. The larger part of this time, especially in the cold weather, was, however, devoted to work in connection with the Land Records. My main work on tour as far as Agriculture is concerned consisted of (i) inspections of the Agricultural Stations at Jorhat, Khagrabari (Kamrup), Karimganj and Upper Shillong, (2) interviews and discussions with officials and others interested in Agriculture, (3) attendance at an Industrial Conference at Jorhat, a Jute Conference at Calcutta and the meeting of the Board of Agriculture at Pusa. I also visited Calcutta, Malda and Berhampur, in connection with the question of the improvement of the silk industry in Assam.

Members of the Superior Staff.

2. As Mr. Birt was on military duty, Mr. Meggitt, the Agricultural Chemist, continued to act as Deputy Director of Agriculture throughout the year. He was on tour for 142 days in all. His charge included the Jorhat and Kamrup Farms as well as all demonstration work in the Assam Valley and in the Khasi and Jaintia Hills. He visited the Kamrup Farm about once a month. His headquarters being at Jorhat, he was able to devote close attention to the Jorhat Farm. Tours were made by him in Sibsagar, Kamrup and the Khasi and Jaintia Hills Districts, for the purpose of inspecting demonstrations and visiting Honorary Correspondents. He also attended the Jute Conference at Calcutta and the ninth meeting of the Board of Agriculture at Pusa as well as visiting Messrs. Birkmyres ' Farm in connection with manurial schemes.

Rai Bahadur Bhupal Chandra Basu continued to be on special duty till the 15th May 1916 when he retired on pension. He was in charge of the Farms at Shillong and Karimganj as well as of demonstrations in the Surma Valley; he also controlled the work of the weaving master. Mr. Basu was on tour for 178 days, of which 59 days were spent in organising flood relief work in Sylhet, 54 days on the Karimganj Farm, 16 days at the Upper Shillong Farm and the rest in inspecting agricultural demonstrations in the Surma Valley, visiting Honorary Correspondents and supervising the work of the weaving master. He also attended the Jute Conference at Calcutta and accompanied Mr. Lefroy, the Imperial Silk Specialist, during his tour in Assam. He was relieved by Mr. Mckay who, during the period from 16th May to 30th June 1916, spent 4 days at the Karimganj Farm, 4 days at the Upper Shillong Farm and 20 days in inspecting demonstrations in Sylhet and the work of the weaving master.

Subordinate Establishment.

3. Maulvi Fazlal Haq Ahmed and Mr. Laksheswar Barthakur held the posts of Agricultural Superintendents throughout the year and were in charge of demonstrations in the Assam and Surma Valleys, respectively. The Maulvi was on tour for 242 and Mr. Barthakur for 246 days, their time was devoted chiefly to inspecting demonstrations and

visiting the Honorary Correspondents of the Department. Mr. Barthakur was on special duty for some time for the purpose of arranging for the supply of seed in connection with relief work in Sylhet. He also made enquiries as to the prospects of sugarcane cultivation in Sylhet and, in collaboration with the Agricultural Inspector, as to the condition and needs of the Jaintia parganas after the floods. He attended the Industrial Conference held at Jorhat and visited various places in the Assam Valley to make inquiries about the possibility of disposing of the sugarcane which is now being grown on the Kamrup Farm.

Srijut Binaram Das continued to hold charge of the Farm at Jorhat and U Harick Sing of that at Shillong. During the absence on sick leave of Babu Rukmini Mohan De, the permanent Superintendent of the Karimganj Farm, the newly appointed Agricultural Inspector, Babu Surendra Nath Gupta, was incharge of that Farm. The staff includes an Assistant Farm Superintendent but the post was not filled till after the close of the year. There is a clerk at each Farm and an Overseer at the Shillong Fruit Experiment Station.

Babus Benode Behari Das and Satyendra Chandra Dutta, Mr. Golak Chandra Bora and U Harry Singh held the posts of Agricultural Inspectors in Sylhet, Kamrup, Sibsagar and the Khasi and Jantia Hills and Garo Hills, respectively. A detail account of their work will be found in Section I of Chapter IV. The three inspectors at Sylhet, Kamrup and Sibsagar were on special duty for sometime in connection with the purchase and distribution of seed in Sylhet. Mr. Lalit Mohan Das was under training at the Karimganj Farm and has since been appointed Agricultural Inspector with headquarters at Karimganj in Sylhet; he takes the place of Agricultural Inspector Babu Surendra Nath Gupta who has been appointed Superintendent of Karimganj Farm.

Babu Satya Ranjan Gupta held the post of Entomological Assistant. An account of the chief work done by him is given in Section III of Chapter III of this Report.

Mr. Smith continued to be the Agricultural Instructor at Sadiya. He was engaged chiefly in looking into local methods of Agriculture in the North-East Frontier district and made experiments with maize, potatoes and wet rice.

During the year 11 demonstrators were employed, of whom 6 were attached to the Assam Valley, 1 to Sylhet, 3 to the Khasi Hills and one to the Garo Hills. These demonstrators include two apprentices from the Jorhat and two from the Karimganj Farm who were appointed to be demonstrators during the year. A temporary demonstrator was employed on terrace cultivation in the Naga Hills. There are two permanent Agricultural Instructors in the Lushai Hills.

Expenditure and Receipts.

4. The expenditure of the Department during the Agricultural year ending on 30th June 1916 amounted to Rs. 1,73,925-4-6 and the receipts to Rs. 15,813-1-0 against Rs. 2,36,498-7-5 and Rs. 10,191-12-4, respectively, for the previous year. The principal heads of expenditure are shown in appendix II. The increase in the receipts of the Department is mainly the result of the sale of seeds in Sylhet and of the produce of the farms being larger than in the previous year.

Decrease in expenditure is largely due to the fact that a big sum spent on steam tackle for the Kamrup Farm was included in the budget of the preceding year.

CHAPTER II.

Agricultural Education.

Nature study in schools.

5. Nature study continues to be part of the curriculum of Primary schools and the Lower Primary Readers in use contain lessons on this and agriculture generally. The work has proceeded on the same lines as during past years and there is nothing new to record.

Apprentices on Government Farms.

6. The Department trains a certain number of apprentices at each of the Government Farms, these are generally sons of cultivators. The training given is thoroughly practical. The apprentices are usually appointed demonstrators after they have satisfactorily completed a course of two years. At the close of the year there were six apprentices on each of the Farms at Jorhat and Karimganj, while the Upper Shillong Farm and the Shillong Fruit Experiment Station each had two.

A Garo youth has been under training at Upper Shillong since April 1915 with a view to being appointed as a demonstrator in the Garo Hills, should his work prove satisfactory. A few youths have been permitted to join as candidates for apprenticeship at the Karimganj and the Upper Shillong Farms. They work as ordinary labourers, the intention being, should they prove fit, ultimately to appoint them as apprentices, as vacancies occur. In the Lushai Hills four Chiefs' sons were under the instruction of the Assistant Agricultural Instructor at Lungleh; they have been taught terracing and fruit growing.

Sabour Agricultural College.

7. Students from Assam who desire higher training in Agriculture, attend the Agricultural College at Sabour. Scholarships of Rs. 20 per mensem are given to inhabitants of this Province. The number which may be granted annually was last year increased to 4. The only stipendiary of 1914 has completed his second year's course and obtained promotion to the third-year class. He is reported to have been doing well. Of the four students admitted to the first year class in the session 1915-16, one has left the College while the others have been promoted to the second year class; their work, however, has not been as satisfactory as it should have been and they have been warned that failure to improve may involve their removal. During the year under report scholarships at Sabour have been granted to the two fieldmen clerks of the Farms at Karimganj and Jorhat. From this year arrangements have been made to train on our Farms for about a year candidates for admission to Sabour College not exceeding four each year; they get an allowance of Rs. 15 per mensem and free quarters. Endeavours have been made, with partial success, to secure candidates with better educational qualification especially as regards knowledge of science, than those who have been sent to Sabour in the past. There is one private student in the third year class while another has obtained admission to the first year class this session. From this year the course in the Sabour College has been reduced, as far as newly admitted students are concerned, to one of two years.

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I—AGRICULTURE.

Experiment Stations.

8. As in last year there are five experiment stations in the Province, namely, the Farms at Jorhat, Karimganj and Upper Shillong, the fruit experiment station at Shillong and the surgarcane experiment station at Khagrabari in Kamrup.

Sugarcane.

9. The sugarcane experiments at Jorhat Farm mainly consisted in the testing of varieties, local and exotic under chemical control, supplemented by manurial and planting experiments. The exotics included Barbadoes seedlings and Mauritius varieties, of which B 147, B 376 and striped Mauritius have established their claims to general superiority in the Assam Valley. These 3 varieties are doing very well under plantation conditions on the Kamrup Farm. Upwards of 92,000 sets of these varieties were distributed during the year from the Jorhat Farm. Three new varieties were obtained for trial direct from Barbadoes, and a further half dozen comprising Barbadoes, Mauritius and Java varieties from Dr. Barber, Imperial Sugarcane Expert; some of these new varieties are showing promise. Manurial experiments on the relative value of oilcake and cowdung tend to show that oilcake can safely be used to replace part of the usual dressing of cowdung without serious loss of crop, but that with plenty of cowdung at hand, and at a given expenditure on manures per acre, it is better, at least at present relative prices, to invest one's money in cowdung. Work is proceeding on the use of a raw manurial phosphate applied before the green manure crop in the 4th year of the cane rotation. The experiment is not sufficiently advanced for any decided verdict to be pronounced as to its effect on the cane crop, but ample evidence is to hand that its cost, on the old alluvium of the Assam Valley, is more than recovered in the crop of mustard which is usually taken once in the rotation.

The results of planting experiments confirm the experience of previous years and indicate that it is mere waste of material to plant more than some 8,000 sets per acre in the Assam Valley. The question of the disposition of these sets is however of importance, and is being studied. A full account of the sugarcane work at Jorhat is given in the report on that station.

With a view to supplying cuttings for demonstration work in the Surma Valley three varieties of sugarcane, *viz.*, B 147, B 376 and striped Mauritius obtained from the Jorhat Farm, were grown during the year on the farm at Karimganj. The crop on the whole was good and might have been a bumper one but for the excessive rain and floods of the year.

10. Work at the Khagrabari Farm nominally began in the year ending in June 1914 Various causes including the late arrival of the steam tackle and problems in connection with drainage and labour, difficulties which could hardly be foreseen, resulted in the experiment proper not beginning till 1914-15. During that year and the year under review the various difficulties have been met and, it is hoped, their solution is a permanent one. It was early recognised that good drainage is the very essence of the problem of successful cane cultivation in this tract. Experience throughout has confirmed this, and the crop which is now on the ground owes its present excellence very largely to the fact that the land was thoroughly drained previous to planting, chiefly with the ditcher which arrived only last cold weather. The soil is inherently fertile, but the water table in the rains is relatively high. The drainage scheme which has been put into effect has apparently lowered the water table from 2 feet below the surface to 3 feet or more. At the close of the year the area reclaimed and under cultivation was 375 acres in all, of which some 250 to 270 acres are under cane. Of this 230 acres are under new cane and the balance under ratoons. Green crops were sown on the area not planted with cane. Planting of the new cane began in the middle of February and was finished by the end of March. The varieties under cultivation are striped Mauritius, Barbadoes 147 and 376. The condition of the cane is far superior to that of the past season and the prospects of a good crop are most favourable. A full account of the work done on the farm during the year under review appears in the report of the Kamrup sugarcane station.

Sugarcane cultivation by steam tackle.

11. The line breeding of rice on the Karimganj farm was continued. The work will for the present be restricted to the early *aus* which was spared by the floods of June-July 1915 mentioned in last year's report and to *sail* which is the most important class of rice grown in the district. The 57 types of early *aus* which were saved from floods were sown; their yields varied within very wide limits. For the purpose of making the primary selection of types of *sail* for a fresh start, seeds of 145 varieties were collected and have since been sown. In view of the experience of last year, duplicates have been kept. So far, however, there has been no serious damage by flood and it is hoped that the danger of such damage is now practically past. Three pure lines of *sail* rice selected by Mr. G. P. Hector, the Economic Botanist of Bengal, were tested in the Farm against two of the most productive local varieties of the same class. Mr. Hector's varieties have done well. A new line of selection—intervarietal selection—recommended by Mr. Hector has also been initiated, *latisail*, one of the most productive varieties of *sail*, being selected as a basis for this work. An experiment has been started in the selection of early rice seed by the specific gravity method, *viz.*, by dipping the seed in brine and using only such grains as are found to sink. Another experiment was also made to test the effect of bonemeal as manure for double crop rice land against no manure. A full account of the rice experiments will be found in the annual report of the Karimganj Farm.

Rice.

An experiment was made in the Upper Shillong Farm to see if land could be brought into a fit condition for growing rice by a process known as 'warping' which consists in covering the land with a layer of soil deposited from running water. This method is used by the Khasis for renovating worn out rice land. An acre of land, which was treated in this way in the previous year, was again sown with wet rice; the yield was better than in the first year of the experiment and considerably better than on the untreated land beside it.

12. At Upper Shillong experiments with potatoes were continued. They included trials of varieties and of different seed rates. To the thirteen varieties tried in the previous year nine new varieties were added. Of the old varieties "Windsor Castle" gave the largest crop, while amongst the new varieties "Epicure" has given the best yield. Potato blight caused by the fungus "*Phythophthora Infestens*" appeared in the farm. The crop was carefully sprayed with Bordeaux mixture, and as a result this year's crop was well over the average both for yield and freedom from disease.

Potatoes.

During the year 20 lots of seed obtained from St. Andrews' University were given to the Department by Mr. Ferguson of Dhamai Tea Estate for the purpose of experiment at the Upper Shillong Farm. They gave varying yields. The potatoes obtained from them have been kept for further trial.

Seven new types of potatoes bred on the farm were grown during last spring with a view to multiplication of seed; the experiment will be continued on a field scale next season. Six varieties of potatoes were grown during the year for the purpose of

seed. The average yield per acre amounted to a little over 149 maunds against 118 maunds in 1915. The total outturn was 618 maunds.

The total outturn of potatoes grown in 1915, the summer and winter crops being taken together, was 1,411 maunds, of which 596 maunds were sold for seed. A full account of the work done is given in the report of the Upper Shillong Farm.

An experiment in varieties of potatoes obtained from Shillong was made at the Karimganj Farm. These varieties were contrasted with those grown from country seed; in spite of defective germination and comparatively poor yields, the Shillong varieties, especially those which had come from *jhum* lands, showed a striking superiority over the local variety.

Green manure crops.

13. At Jorhat work up to date has shown that certain crops, *e.g.*, dhaincha and cowpeas, will make fair growth on the soil of the Farm without any special soil treatment, while others, *e.g.*, sunn hemp, refuse to grow in the absence of liming. So far our experience indicates that no green crop compares with cowpeas for general use or for catch cropping. Several new varieties of cowpeas have been tried in special circumstances, amongst standing crops. The use of raw basic phosphates in conjunction with green manuring is being investigated in a rotation; the results so far point to the fact that if applied before the green crop is sown the raw phosphate assists not only the immediate green crop but subsequent crops also.

At Karimganj a dressing of ground limestone was given to dhaincha and cowpeas grown as green manure for paddy. In all cases the limed plots gave a heavier crop than the unlimed.

Fodder crops.

14. All attempts to grow exotic fodder crops at Upper Shillong having failed, only country crops, maize, job's tears and millet known as *raishan* are grown as fodder. The first two are preserved in a silo and the last is made into hay. Both methods of preservation have proved successful. Jowar was sown for fodder at the Karimganj and Kamrup farms. It did exceedingly well in Kamrup but for various causes, apparently of an exceptional nature, was not on the whole, successful in Karimganj.

Jute.

15. An experiment with jute was continued at the Karimganj farm. The three varieties tested against one another were the same as in last year, *viz.*, Mr. Finlow's pure line breed, a variety obtained from Goalpara and a local variety. There were two plots of $\frac{1}{10}$th acre for each variety. Mr. Finlow's variety gave the highest yield, the ratio of outturn in the order in which the varieties have been named being approximately 25: 21: 15. The experiment is being repeated on a larger scale.

Fruit.

16. The Fruit Experiment Station at Shillong has, under the able supervision of Mr. C. H. Holder, continued to make satisfactory progress. The total area of the garden is 48·23 acres; out of about 20 acres which are suitable for fruit growing some 17½ acres have been planted. The whole of the planted area has been terraced, denudation of the soil by rainfall thus being prevented. Good fruit including numerous varieties of apples, has been produced during the year. A full account of the work up to the end of June has been published in a separate report.

At the Upper Shillong Farm, fruit is grown on a very small scale.

Section II.—Agricultural Chemistry.

17. Mr. Meggitt, Agricultural Chemist, in addition to the chemical control of the cane work, continued his soil improvement investigations at Jorhat. These now included a more or less complete study of the use of lime on sour soils with special reference to the rate, frequency and depth of its application, due regard being paid to the nature of the cropping.

Hand in hand with the above work, the maintenance of the supply of organic matter in the soil by the use of green-crops, and in conjunction with this, the economic potentialities of the use of raw mineral phosphates (with a view to making use of the natural phosphate deposits of India) are both being studied in the field. Work on the soil toxin isolated from the Jorhat soil in 1912 has been continued during the year as far as it can be in the field, without contemporary Laboratory study. Observations lead one to suppose that the occurence of this toxin is fairly wide spread in the old alluvium of the Assam Valley; it further seems that bad drainage and the absence of a sufficiency of lime in the soil are contributory causes to it

formation, and that with improved drainage and the use of lime its poisonous effects rapidly disappear. Further, certain crops appear to be more tolerant of the presence of this toxin than do others. Again, its evil effects seem to be aggravated by the absence of a sufficient variety and quantity of available plant foods in the soil.

The experiments laid down, some of them years ago, for the study of the above aspects, are all still under observation, and though much has been learnt, a wide field still opens out for further work. One aspect of the use of lime more recently being investigated, promises exceedingly interesting and important results. This is in regard to the depth of its initial incorporation with the soil. All one can say at present is that the nature of the cropping appears very largely to determine this. What the work at Jorhat has very definitely proved up to date is the vital importance for most cropping, of the use of lime, green manure and phosphoric acid on the old alluvium of the Assam Valley; the increasing amount of attention which is being paid to their proper use throughout the valley is most encouraging.

For details in regard to the work outlined above the annual report of the Jorhat Farm for 1916, and previous years may be consulted.

Section III.—Entomology.

18. During the year the Entomological Assistant was on tour for 170 days. He attended to numerous reports of insect pests, instructing cultivators as to remedial and preventive measures and giving practical demonstrations on their fields. I regret that space does not admit of a detailed description of his work.

A small Laboratory has been fitted up for his use.

CHAPTER IV.

DISSEMINATION.

Section I.—Demonstration.

Localities.

19. Demonstrations were carried out in four districts, *viz.*, Sibsagar, Kamrup, Sylhet and the Khasi and Jaintia Hills. The Agricultural Superintendents and Inspectors assisted by the Demonstrators were in immediate charge of the work in both the Surma and Assam Valleys. The Agricultural Inspector, Khasi and Jaintia Hills, with the assistance of demonstrators conducted the demonstrations in that district. The whole of the work was under the supervision of the Deputy Directors. The small staff in the Surma Valley was engaged for a considerable time on work in connection with the abnormally high floods in Sylhet. This consisted chiefly in making enquiries about the condition of the people, crops and cattle and in procuring various kinds of seeds for cultivators in the affected areas. From reports received it appears that the seed potatoes and paddy did fairly well on the whole. The cold weather crops for which seed was supplied appear to have suffered from abnormal drought.

Rice.

20. Manurial demonstration with bonemeal and flour-phosphate laid down in Kamrup and Sibsagar in the year 1913 were kept under observation for the third year. During the third year the increase due to manures applied was not very uniform or great. In Kamrup the average total net profit per acre for the 3 years amounts to Rs. 20 for bonemeal against only Rs. 4-8 for flour phosphate. In Sibsagar flour phosphate has given uniformly a better result than bonemeal. The average total net profit per acre in 9 centres for the 3 years being Rs. 33-8 for flour phosphate against only Rs. 14 for bonemeal, the total expenditure on manures being Rs. 7-8 for flour phosphate and Rs. 9 for bonemeal per acre. Four new centres in Kamrup and eight in Sibsagar were opened this year for demonstration with bonemeal alone. At each centre one plot was manured with bonemeal at the rate of 3 maunds per acre, the other being untreated. In Sibsagar the manure plots showed an average increase of 400 lbs. per acre while in Kamrup in case of *sali* paddy, the increase was 136 lbs. per acre.

In Kamrup an experiment was made for the first time with green manuring for paddy against bonemeal and against no manure with the result that both the green manured and bonemeal plots gave approximately the same increase in yield over the untreated plot, *viz.*, some 4 maunds of grain per acre.

In Sylhet eleven new demontrations were laid down during the year. Seven of these were designed to demonstrate the effect of bonemeal on the rice crop. Besides these, the two plots of 1914-15 were also kept under observation in order that the

residual effect of bonemeal applied in 1914 might be noted. The heavy rain and floods interefered seriously with these demonstrations. Definite results were, however, obtained in case of some of them and the use of bonemeal and flour phosphate was found to yield some profit.

In the Khasi Hills new demonstrations with bonemeal were made at 20 centres. The average increase in yield of grain from bonemeal plots was about 420 lbs. per acre over untreated plots. This comes to rather more than the cost of the bonemeal. Any increase in subsequent years will be pure profit. The demonstrations laid down in 1914 were also kept under observation without further manure and the yield of grain from bonemeal as against untreated plots averaged some 430 lbs. grain per acre and gave a net profit on the two years' working of some Rs. 28 per acre.

The demonstration plots of 1913 treated with bonemeal against flour phosphate and against no manure were kept under observation with a view to ascertaining their residual effect. The plots were not further manured during the year. The total net profit of these demonstrations for the 3 years averages Rs. 40 per acre for plots treated with bonemeal and Rs. 19 for those treated with flour phosphate. It is evident that bonemeal is by far the better manure for paddy in the hills, though if raw manurial phosphate could be obtained cheaply, it would pay very well.

Sugarcane.

21. Demonstrations with superior varieties of cane were undertaken at 6 centres in Kamrup and 16 in Sibsagar. The unfavourable season was somewhat detrimental to this work, but in all cases an increase, and in many a way considerable increase in the weight of gur per acre resulted from the use of the Jorhat varieties. The demand for sets of superior varieties was very great during the year in both districts. Only 92,000 sets could be supplied, of which 24,000 were distributed in Kamrup, and the rest in Sibsagar. The three-roller iron-sugarcane-crushing mills have already secured a hold on public appreciation in the Assam Valley. Demonstrations with these mills were continued with success in six centres in Kamrup; and as a result, 6 mills were sold. In Sibsagar 4 mills were let out on hire for the whole crushing season and 9 were sent out for the purpose of demonstration.

In Sylhet demonstrations were given at two centres, with two mills of this kind. The cultivators who tried the mills were favourably impressed with their efficiency and expressed their intention of purchasing mills of this type.

Potatoes.

22. In Sylhet 600 maunds of seed potatoes were supplied to the inhabitants of flooded areas, the greater part of them going to the Jaintia parganas. As the crop was new to the district the Agricultural Superintendent and the Agricultural Inspector instructed the cultivators in the proper method of planting and cultivation. Three temporary depôts for the sale of Khasi Hills seed potatoes were opened during the year and 200 maunds were issued through them.

Demonstrations in growing superior varieties of potatoes against the local bazar seed were also made in Sibsagar and Kamrup. Some of the demonstrations showed poor results partly owing to bad germination and partly owing to some of the crop being stolen from the fields before the time of harvesting. In 11 centres very substantial increases in yield per acre were obtained from using departmental as against bazar seed, these increases amounting to over 100 per cent. in many cases.

Two demonstrations in potato cultivation were made in parts of the Khasi and Jaintia Hills, in which potatoes are not generally grown. The spraying of cultivators' potato fields with Bordeaux mixture was continued but was done on only a very small scale; this is reported to be due to the fact that the potato crop was comparatively free from blight.

At Durtlang in the Lushai Hills, 7 maunds of 'Magnum Bonum' potatoes obtained from the Shillong Farm were planted in $\frac{1}{4}$ of an acre of land. The application of oilcake increased the yield considerably, but it would have been greater than it was had not the crop been attacked by disease. The outturns of rains and winter crops were not good. Potatoes cultivated in Mokokchang and Ungma villages in the Naga Hills yielded a good crop.

Terrace cultivation.

23. In the Naga Hills terraces were made in one village in Sadar and in four new villages in Mokokchang; the existing areas were also extended. The crop reaped was excellent.

In the Lushai Hills two Angamis were employed at Aijal and one at Lungleh to help in starting terrace cultivation. At Aijal 833 terraces were made. A few

terraces were also made in Lungleh for the purpose of demonstration in this subdivision. Seeds of different varieties were sown and the seedlings are doing well. The area of land around Aijal and Lungleh suitable for this kind of cultivation is not very extensive. Satisfactory progress has, however, been made during the year and the cultivation is expected to extend gradually. The crop of wet rice at Champhai and North Vanlaiphai during the year was good. On the North-East Frontier two Angami demonstrators were employed solely on wet rice cultivation at Rotung and Pasighat; the experiments gave good results.

The terrace experiment at Dhamalguri in the Garo Hills has not yet begun. The demonstrator posted there was engaged in supervising a terracing experiment undertaken at Tura, and in familiarising himself with local agricultural conditions and crops.

Fruit.

24. Demonstrations in fruit culture continued to progress in the Lushai Hills, though the fruit trees planted in the Sairang garden were unfortunately damaged by a severe hailstorm. About 14 lbs. of orange seed were obtained from the Khasi Hills, of which 3 lbs. were sown and the remainder sold. About 800 common pine-apple slips and 365 Singapore slips were distributed during the year. While 945 orange seedlings are ready for distribution. In the Naga Hills some apples, almonds and apricots were planted; they are doing well.

In the Khasi Hills demonstrations in grafting were made as usual. Five hundred and forty-four oranges were budded and 418 pears, 189 peaches, 58 apple, 42 plum, 8 nectarine, and 43 apricot grafts were made during the year.

Demonstration by honorary correspondent.

25. Babu Jnan Chandra Roy, Honorary Correspondent of Nowgong, cultivated about one-third of an acre of sugarcane with B 147 and 376 varieties supplied by the department. The crop was excellent. The canes were about 14 feet long and very thick; about 42 maunds of *gur* were obtained from about one-third of an acre. He also very successfully grew a few exotic varieties of paddy.

Srijut Deveswar Sarma Barthakur of Sibsagar was appointed as Honorary correspondent and placed in charge of the agricultural demonstrations carried out by Srijut Thaneswar Sarma Barthakur. He continued his sugarcane cultivation successfully. The nett profit from the first year of "Tana" cane was Rs. 391 per acre, from the second year of ratoon Tana cane Rs. 254, while from the third year's crop of the same variety the nett profit was Rs. 201-12 against Rs. 121-13 per acre obtained from the first year's crop of a local variety.

Srijut Narayan Barua, Honorary Correspondent, Nakachari, kept paddy manuring and seedling experiments under observation for the third year; the results were as satisfactory as in previous years. He also tried several varieties of *sali* paddy. His own selected variety, George *sali*, yielded 38 maunds per acre. He has for the last six years been experimenting with success in the cultivation of arrowroot.

Srijut Deveswar Gosain of Barpathar continued to work his small sugar factory and made a good profit during the year; he grew Barbadoes and Mauritius canes acclimatised at Jorhat.

Srijut Pithumbar Saikia of Khowang kept under observation his paddy demonstration using bonemeal *versus* cowdung *versus* no manure. No comparison could, however, be made as some of the plots were damaged by floods. He was supplied with sets of striped Mauritius.

Maulvi Abdur Rahim Chowdhuri, Honorary Correspondent in Sylhet, continued his bonemeal experiments, but the plots were largely damaged by floods.

It is a satisfactory feature of the year's work that a few gentlemen in the Assam Valley, who are not Honorary Correspondents of the Department, have shown a keen interest in the matter of agricultural demonstrations either by carrying them out themselves or by otherwise assisting the officers of the Department.

Section II.—Aid to the public.

Fungus disease.

26. With a view to the combatting of orange blight oranges were as in last year budded on old limes and wild citrus stocks. Up-to-date this has been a success. Specimens of diseased pan plants were sent for investigation to the Imperial Bacteriologist at Pusa; the result has not yet been reported.

The potato crop in the hills has this year been comparatively free from blight and there has been but little demand for spraying with Bordeaux mixture.

Seed supply, etc.

27. During the year Babu Satyendra Chandra Dutta, Agricultural Inspector, Kamrup, was in charge of the seed depôt at Gauhati. The following seeds, manures and implements were sold from the seed depôt; approximate figures are given :—

Seeds—161 mds., of which 83 mds. were seed potatoes, 2 mds. jute, 3 mds. cotton and 29 mds. oats.

Manure—19 mds. (bonemeal and saltpetre).

Implements—23, of which 6 were sugarcane mills, 3 *gur*-boiling pans, 10 planet junior hand hoe and 1 Meston plough.

Among other seeds which were sold may be mentioned *juar*, *dhaincha*, sunn hemp and certain varieties of pulses and paddy. In addition to the above, seeds and manures to the value of Rs. 450 were distributed for demonstration purposes and to Government Farms. Upwards of 92,000 sets of sugarcane were distributed from the Jorhat Farm.

From the Upper Shillong Farm the following were issued during the year :—

	Mds.
Seed potatoes	596
Oil cake for manure	21
Rhubarb roots	159
Strawberry plants	40
Pear grafts	4

The Agricultural Inspector, Khasi and Jaintia Hills, supplied the following :—

	Mds.
Orange seedlings	1,600
Maize seed	8

One of the main features of the seed supply during the year was the purchase of seed and its distribution in the flood-stricken area of Sylhet. The following were the seeds supplied :—

Potatoes—600 mds., of which 456 mds. were supplied to the Jaintia parganas.

Linseed—309 mds., of which 305 mds. went to the Jaintia parganas.

Amon paddy seed—4,130 mds.; all for Gowainghat tahsil.

Wheat—16 mds. supplied to Habiganj.

A few maunds of cereals, pulses and mustard were also supplied.

The work of bone grinding at the Upper Shillong Farm was continued during the year. Some 307 maunds of bones collected in the hills were crushed; they yielded 283 maunds of bonemeal. Out of this quantity 241 maunds were sold at prices ranging from Rs. 3-8 to Rs. 4-14 per maund. During the year two temporary depôts for the sale of seed potatoes were opened in the Khasi Hills. The total quantity sold was 296 maunds. The sale of seed potatoes in these hills had to be restricted on account of the great demand in Sylhet.

Section III.—Sericulture.

28. Mr. Lefroy, the Imperial Silk Specialist, this year visited some of the principal centres of the silk industry in this province. In connection with Mr. Basu's report on the silk industry of Assam I went to Calcutta, Malda and Berhampur in Bengal. Mr. Lefroy's recommendations will be considered before a decision is arrived at on the subject of taking measures to assist the silk industry in this province.

29. As desired by Mr. Lefroy a small quantity of Madagascar seed has been reared at the old Fruit Garden at Umlyngka near Shillong. The Roman Catholic Mission being unable to continue its sericultural work there, the control of this garden has been resumed by the Agricultural Department. The rearing of this seed has been, on the whole, a success. Some French var silk worms were obtained through this Department and reared by two individuals in the Khasi Hills. Owing to the mulberry suffering from dry weather, the yield was not good. There were some requisitions for *eri* and silk cocoons which were complied with.

Practically work in Sericulture in this province is at a standstill. As already indicated, Mr. Lefroy's advice is awaited, while financial conditions at present stand in the way of much being done. The problem is a big one and it is anticipated that it cannot be properly solved without good expert advice and considerable expenditure.

Section IV.—Agricultural Shows and Exhibitions.

30. The usual annual Agricultural show for the Khasi Hills and agricultural meeting at the Upper Shillong Farm were not held during the year under report on account of the outbreak of cholera in an epidemic form in several parts of the district.

Section V—Agricultural Associates and Honorary Correspondents.

31. At the close of the year there were 27 correspondents against 26 in the previous year; two of them held the post of Associate. A list of Honorary correspondents is appended to this report. Two new appointments were made while one correspondent died during the year. An account of the chief work done by some of the correspondents is given in paragraph 25. The officers of the Department endeavoured to keep in touch with them.

CHAPTER V.

Operations for the improvement of Live-stock.

Cattle breeding.

32. The herd of Patna and cross-bred cattle which is maintained at the Upper Shillong Farm, numbered 88 at the close of the year under report as against 74 in the preceding year. The demand for bulls bred at the farm still far exceeds the supply. During the year there were only three bulls for sale, they were sold to Khasi cultivators. There is a great demand for cows bred at the farm but they cannot at present be spared for sale to the public. Several of the cows on the farm have yielded over 200 gallons of milk in the season, while one gave as much as 271 gallons in eight months. The size of the animals being taken into consideration, this is a very satisfactory yield. The income from the sale of milk amounted to Rs. 1,949-8-6 against Rs. 1,052-15-0 in the previous year. One of the two breeding bulls on the Farm is too old for service, and, the other, though comparatively young, needs to be replaced in order that in-breeding may be avoided. Steps have been taken to import an Ayrshire bull but difficulties arising out of the war have resulted in delay. That the Upper Shillong Farm cattle are being more and more appreciated is evident from the growing desire of people for the services of bulls bred on the farm; the fine stock of milch cattle in the farm is the result of many years of work and whatever plan for the breeding of cattle in this province is ultimately adopted, use should, I think, be made of it.

The scheme for importing Manipuri bulls, to which reference was made in last year's report, had to be abandoned for want of the necessary funds. Mr. Blackwood's report on the special enquiry which he made as to cattle breeding is now in the press. His proposals will be taken into consideration before a scheme is drawn up for improvement of the cattle of the province. This is one of the big problems which we shall try to solve, when money is forthcoming.

Sheep breeding.

33. The results of the sheep breeding experiments in Shillong were so disappointing that it was decided to abandon them for the present. Such remnants of the flock as had been spared by disease and death were sold off during the year. As pointed out in last year's report, one of the chief difficulties was want of pasturage in the cold weather. It is hoped that the experiment may be later on renewed in more favourable conditions.

Poultry breeding.

34. Poultry breeding under the supervision of the Superintendent, Lushai Hills, was continued. During the year the total number of eggs obtained from imported birds was 3,833; of these 3,592 were sold to Lushais and others at one anna each, and 241 were used for hatching. It is satisfactory to observe that the number of eggs sold was considerably larger than in the previous year, this being apparently due to the reduction in price from two annas to one. During the year 71 fowls and 7 ducks were sold in the district, while a few fowls and eggs were exported to the plains.

On the first April 1916 there were approximately 5,386 birds in the district of which 5068 were in villages and 318 on the farm. Langshans are the only English breed which has survived in villages but experiments in cross breeding of these with

Buff Orpingtons and Lushai birds are now being made. The total sale-proceeds of the farm amounted to Rs. 360-15-6 against Rs. 383-14-0 of the previous year, while the total cost was Rs. 1,565-1-11 against Rs. 1,494-11-0.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Agricultural publications.

35. The following leaflets and bulletins were published by the Department in the course of the year :—

Bulletin No. 1 of 1915—Cultivation of sugarcane.

Leaflet No. 1 of 1915—Price list of Seed Depôt.

Leaflet No. 2 of 1915—Iron sugar mills and shallow pans.

Leaflet No. 3 of 1915—Varieties of sugarcane.

Leaflet No. 4 of 1915—Potatoes in the Assam plains.

Leaflet No. 5 of 1915—Fodder crops.

All of these have been published in English, Bengali and Assamese. The bulletins and leaflets published last year were this year issued in the vernacular. At the suggestion of the Deputy Commissioner, Sylhet, a leaflet in Bengali dealing with insect pests in paddy was issued.

A series of pamphlets on insect pests is in the course of preparation.

Reports on the work of each agricultural station and on agricultural demonstrations are published annually in the autumn.

Supply of information.

36. Various requisitions for information relating to agriculture, fruit culture, sericulture and industries in the province were received from private individuals and concerns and complied with. Honorary Correspondents were supplied free with copies of all departmental publications and reports and were given information and advice on agricultural matters.

CHAPTER VII.

MISCELLANEOUS.

Weaving.

37. The Weaving Master Babu Nani Gopal Mitra was on tour for 218 days; he did work in nearly all the plains districts of the province as well as at Shillong.

Besides supervising the activities of weavers in centres in which he had already given demonstrations he gave in certain new centres demonstrations of the advantage of using improved looms and appliances including the fly-shuttle loom. Among the centres where useful work has been done were the Sylhet and Tezpur Jails. He has been able to reduce from Rs. 8 to Rs. 7 the price of the improved slays required for fly-shuttle looms; 20 of these were sold during the year while more were being made. He has done good work in helping weavers to buy new appliances while he reports that they have purchased through him no less than Rs 2,000 worth of yarn from Bombay and Calcutta. He endeavoured, with some success, to induce certain weavers to make a better class of cloth.

Two students trained at the Serampore Weaving School were appointed Weaving Demonstrators jointly by the Gauhati and Nowgong Local Boards. The Tezpur Local Board also employed a weaving teacher.

The report of Mr. Hoogewerf, Principal of the Government Weaving Institute at Serampore, on the weaving industry in Assam was received towards the close of this year. It should, I think, be considered in the light of such recommendations as may be made by Mr. Lefroy.

Co-operative Societies and Agriculture.

38. While fully recognising the very great desirability of the Agricultural Department working with and through Co-operative Societies, I am sorry that I have practically nothing by way of progress to report under this head. Till both Departments, especially that dealing with co-operation; are strengthened, little can be done. As far as the Agricultural Department is concerned it will obviously be in a much better position to help Co-operative Societies and be helped by them when it is able to supply, on a large scale such products as improved paddy seed. At present, its work is largely experimental.

General Progress.

39. Last year I had to draw attention to the temporary failure of the work at the Karimganj Farm. This year prospects are much brighter and there is good reason for hoping that this farm will ultimately prove a success. The main object of the farm being the supply of paddy, the chief crop of the province, it may I think be rightly regarded as of peculiar importance

The Kamrup sugarcane farm has, this year, scored a decided success. There is the strongest reason for hoping that this year's crop will be large and of good quality.

Mr. Holder has made good progress with the Fruit Experiment Station while the Upper Shillong and Jorhat Farms continue to do useful work.

Without a full staff it is impossible for the Department to do its work adequately. The appointment of Mr. McKay gives us a second Deputy Director, though at present owing to the absence of Mr. Birt on military duty, we are not able to reap the full advantage of this appointment. The appointment of two new Inspectors, which was referred to in last year's report, was actually made during the year under review. Another Inspector was appointed on probation this year. But this is counterbalanced by the loss of a Farm Superintendent whose health broke down. The Department has this year employed 11 demonstrators as against 8 last year. What is of still more importance than the immediate increase of staff is the fact that new men are being trained in larger numbers than in the past. That the Surma Valley has only one demonstrator shows how greatly the Department is undermanned. In the matter of staff the department has, I am glad to say, been proceeding on what are generally considered to be sound lines, *i.e.*, instead of building up its staff from below, it has worked downwards. A big staff of demonstrators without proper supervision is practically useless, if not worse than useless.

It is not, I think, necessary for me to refer here to details of progress. Before big results can be obtained much preliminary work has to be done both in the matter of experiment and of training an adequate staff. Though we have, I hope, made some considerable progress as regards helping the raiyat and the province as a whole much time must necessarily be spent in making secure the foundations of our work.

Notice of services.

40. To save space, I shall refer only briefly to the services of officers.

The Deputy Directors and late Special Officer have given me much help for which my thanks are due.

Mr. Chaston, Manager of the Kamrup Farm, has brought his labours to a successful issue, in spite of difficulties which can hardly be realised without a visit to the locality. Mr. Holder has devoted the greatest care and attention to the Shillong Fruit Experiment Station.

The Deputy Directors report well on most of their staff. The favourable remarks made on previous reports generally apply. I single out for special mention Babu Satyendra Chandra Dutta, Agricultural Inspector, Kamrup; Babu Surendra Nath Gupta, Superintendent of the Karimganj Farm; Babu Nani Gopal Mitra, Weaving Master, Babu Satya Ranjan Gupta, Entomological Assistant; Srijuts Sarvananda Sarma, Clerk of the Kamrup Farm, and Bhudhar Phukan, Demonstrator. Most of the other officers have done well; the three or four, including several demonstrators, who have not, will be dealt with departmentally.

My Head Assistant Babu Dinesh Chandra Das and the members of the office staff concerned have given much help in the preparation of this report.

SHILLONG;

The 14th September 1916.

A. R. EDWARDS,

Director of Land Records and Agriculture, Assam.

APPENDIX I.

List of Honorary Correspondents of the Department of Agriculture in Assam (the names of correspondents who are also associates are marked).*

SYLHET.

1. D. Ferguson, Esq., Dhamai Tea Estate, Post Office, Dakhinbag.
2. Babu Girija Nath Biswas, Post Office, Baniachang.
3. „ Hara Kishore Gupta, Post Office Pail, Habiganj.
4. „ Pavitra Nath Das, Post Office, Beani Bazar.
5. „ Raj Kumar Nandi, Sylhet.*
6. „ Bidya Kumar Chowdhury, Sunamganj.
7. Maulvi A. M. Chowddury, Zamindar, Kanihati, Post Office, Hazipur, South Sylhet.
8. „ Abdur Rahim Chowdhury, Zamindar, Village Sultanpur, Post Office, Jalalpur, Sylhet.
9. James Laurie, Esq., Post Office, Nariancherra, Akbarpore, Queen Pine Apple Estate, South Sylhet.
10. Babu Joynath Nandi Mazumdar, Post Office, Bejura, Habiganj.

CACHAR.

11. Babu Sarada Charan Chakarvarty, B.A., Assistant Inspector of Schools, Silchar.
12. „ Bharat Chandra Chowdhury, Salchapra, Cachar.

KHASI AND JAINTIA HILLS.

13. U Job Solomon, Shillong.
14. U Kubur Singh, Mylliem.
15. U Bordhon Roy Kanti, Mahadev, Cherrapunjee.
15. U Helikton Passah, Head Master, Upper Primary School, Jowai.

GOALPARA.

17. Babu Dijesh Chandra Chakravarti, Manager, Gauripore Estate.
18. „ Lalit Mohan Datta, Dhubri.

KAMRUP.

19. E. P. R. Gilman, Esq., Barduar Tea Estate, Post Office, Palasbari, Kamrup.
20. Munshi Kaymubir Rahman, Gauhati.
21. „ Tayab Ali, Sonapur, Kamrup.

DARRANG.

22. Babu Jatindra Chandra Maitra, Tezpur.

NOWGONG.

23. Babu Jnan Chandra Ray, Baithulongso Post Office, Kamrup.

SIBSAGAR.

24. Srijut Deveswar Sarma Barthakur, Thakurbari Farm, Post Office, Haloguri.
25. „ Deveswar Gossain, Barpathar Sugarcane Farm, Post Office, Badlipur (Golaghat*).
26. „ Narayan Chandra Barua, Nakachari, Lahing, Jorhat.
27. „ Pithambar Saikia, Mauzadar, Khowang, Post Office, Khowang (Lakhimpur).

APPENDIX II.

Statement showing the receipts and expenditure of the Department of Agriculture for the year ending the 30th June 1916.

Receipts.	Amount.			Expenditure.	Amount.		
1	2			3	4		
	Rs.	as.	p.		Rs.	as.	p.
(*a*) Sale of manure and farm produce.	9,037	2	7	(1) Superintendence ...	37,015	10	6
(*b*) Potatoes	819	6	3	(2) Agricultural instruction ...	1,403	11	8
(*c*) Other receipts ...	3,255	6	2	(3) Agricultural Chemist ...	13,241	15	6
(*d*) Receipts from Seed Depôt	2,701	2	0	(4) Experiment Stations ...	1,11,301	11	9
				(5) Agricultural demonstrations and experiments.	8,589	15	5
				(6) Public Exhibition and Fairs	369	11	0
				(7) Bull breeding operation ...	532	11	3
				(8) Poultry breeding operation	1,469	13	5
Total receipts ...	15,813	1	0	Total expenditure ...	1,73,825	4	6

A. S. P O. (R. & Agri.) No. 36—510—28-10-1916.—A. E. R.

Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 3815R., dated the 25th October 1916.

Read—

The report of the Department of Agriculture, Assam, for the year ending the 30th June 1916.

RESOLUTION.

MONEY and trained agents are the essential requisites for marked progress in the Agricultural Department, and during the war neither of them can be obtained. For this reason, though the year under review was a year of much good work, it is impossible to hope for any great development of the activities of the Agricultural Department till peace is restored. Sanction was accorded in 1915 to the appointment of a second Deputy Director of Agriculture, but, as this appointment was not filled till the retirement of Rai Bahadur Bhupal Chandra Basu, who, although not a member of the Department, was actually discharging the duties of a Deputy Director, there was no real access of strength. Mr. Birt being still on military duty, Mr. Meggitt, the Agricultural Chemist, continued to fill his place. There was a small increase in the subordinate staff, from 24 to 27 officers, but the fact that in the whole of the Surma Valley only one demonstrator is employed indicates how urgently it needs strengthening. Difficulties are, however, still experienced in obtaining the requisite material. An increase in the number of stipends in the Sabour Agricultural College was sanctioned in 1915, but of the four students recruited in the year 1915-16 one has already left the College and the work of the other three has not been entirely satisfactory. Arrangements have accordingly been made to give a preliminary training to candidates for Sabour on the provincial farms, and by this means it will be possible to test their aptitude for the profession which they are thinking of adopting.

2. The crops to which the Department pays special attention at its experimental stations are sugarcane, potatoes and rice. The sugarcane experiments were continued at the Jorhat Farm and much good work has been already done in selecting and establishing good varieties. The better kinds of cane are warmly appreciated, and no less than 92,000 sets were distributed during the year. At Khagrabari an experiment on a large scale is in progress with the object of ascertaining whether cane can be cultivated with steam tackle on commercial principles for the manufacture of refined sugar. Up to date the outlook is most promising, and over 250 acres have been planted out. Rice is the speciality of the Karimganj Farm, and the experiments in line breeding, which were so seriously interfered with by the flood of 1915, were continued. The work on this farm is at present almost entirely of an experimental nature, but is likely in the future to have the most far reaching results. The value of the work done at the Shillong Farm in connection with potatoes was established many years ago, but this particular activity of the Department was especially useful during the last year, as there was a great demand for potato seed in the localities in the plains in which the winter rice crop had been destroyed by flood, with the result that nearly 600 maunds of potatoes were sold for seed from the Shillong Farm. The fruit experimental station at Shillong continued to make satisfactory progress and 17½ acres have now been planted out with various kinds of fruit-trees. Excellent fruit was obtained from some of the older trees, and the experiment is one of great promise.

3. The demonstration work undertaken dealt for the most part with the value of manures, the qualities of different varieties of sugar-cane, and the cultivation of potatoes. Attempts were also made to extend terraced rice cultivation in the Lushai Hills and the Abor Hills, the results obtained being generally satisfactory. The Chief Commissioner attaches the greatest importance to this work and looks forward to the time when the wasteful practice of *jhuming* will to a large extent have been superseded by the permanent cultivation of wet rice on properly constructed terraces. It is particularly satisfactory to observe that the various demonstrations made by honorary correspondents in connection with sugarcane, paddy and manures were

unusually successful, and must in most cases have been a source of considerable profit to those who undertook them. This being the case, it may reasonably be hoped that these experiments will be extended, and that the people of the locality will lose no time in following the lead given them.

4. Lack of funds prevented the question of cattle-breeding being taken up on a large scale, but the success of the cross-bred herd at the Shillong Farm has already been established, and the demand for the stock is considerably in excess of the supply. It is stated that one of the cows on the farm yielded 271 gallons of milk in eight months, an exceptional record in a province where the indigenous cow seldom yields more than three-fourths to one seer of milk. There has been a great improvement in the breed of cattle in the vicinity of Shillong, and, when money is once more available, attempts will be made to improve the live-stock of the raiyat at different centres in the province. Closely connected with this question is the provision of proper fodder. The reservation of grazing grounds in localities where this is still possible continually engages the attention of the Chief Commissioner and his District Officers, but it is doubtful whether this is enough, and Sir Archdale Earle is accordingly much interested to hear of the attempts to cultivate fodder crops. Unfortunately it appears that, though *Jowar* did excellently in Kamrup, it was only partially successful in Karimganj. The experiments will no doubt be continued, as they are obviously of vital importance to the whole question of cattle-breeding and the supply of dairy products. Poultry rearing was successfully prosecuted in the Lushai Hills and sericulture carefully examined in all its branches. But in the absence of funds no progress can be made and we can hope for little advance till normal financial conditions are restored.

5. The Chief Commissioner has read with interest the list of honorary correspondents, and congratulates them on the valuable work which they are doing in connection with the improvement and development of the great industry of the country. He is indebted to Mr. Edwards for the care with which he has administered the Department and to Mr. Edwards' Assistants for the good service they have rendered. Mr. McKay, Mr. Meggit, Mr. Chaston and Mr. Holder have all done excellent work; and the Chief Commissioner is also glad to read the favourable remarks recorded by the Deputy Directors as regards their own staff, and of the Director as regards his Head assistant and the members of his office staff. Finally, the Chief Commissioner wishes to refer to the admirable record of Rai Bahadur Bhupal Chandra Basu who left the Department at the end of the year after a life-time devoted to the cause of agriculture. In his retirement he will be able to reflect with gratification on many years well spent in furthering the interests of the cultivating classes.

ORDERED that a copy of this Resolution and of the report, together with the Shillong Fruit Station report, be published in the *Assam Gazette* for general information.

By order of the Chief Commissioner of Assam,

B. C. ALLEN,

Chief Secretary to the Chief Commissioner of Assam.

12

REPORT

OF THE

SECRETARIAT BOMBAY LIBRARY

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending the 30th June 1918.

SECRETARIAT LIBRARY BOMBAY GOVERNMENT

SHILLONG:
PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1918.

Price 9d.] [*Price 8 Annas.*

Agents for the sale of Books published by the Assam Administration.

Agents in India.

(1) Messrs. Thacker, Spink & Co., Calcutta.

(2) Messrs. W. Newman & Co., Calcutta

(3) Messrs. S. K. Lahiri & Co., Calcutta.

(4) Messrs. A. M. and J. Ferguson, Ceylon.

(5) Messrs. R. Cambray & Co., 6 and 8/2, Hastings Street Calcutta.

(6) Messrs. Thompson & Co., Madras.

(7) Babu Hari RamDhar, B.A. Popular Library, Dacca.

(8) Messrs. D. B. Taraporevala Sons & Co., 103 Meadow Street Fort, Post Box No. 187, Bombay.

(9) The Indian School Supply Depôt, 309, Bow Bazar Street, Calcutta.

(10) Messrs. M. C. Sircar & Sons, 75, Harison Road, Calcutta.

(11) Messrs. Students & Co., Cooch Bihar.

(12) Messrs. Vas & Co., Madras.

(13) The Standard Literature Co. Limited, 23-1, Old Court House Street, Calcutta,

(14) The Standard Book Stall, Karachi.

Agents in England.

(1) Messrs. Constable & Co., 10, Orange Street, Leicester Square, W. C.

(2) Messrs. Kegan Paul, Trench, Trübner & Co., 68—74, Carter Lane, E. C., London, Oriental Department, 25, Museum Street, London, W C.

(3) Mr. B. Quaritch, 11, Grafton Street, New Bond Street, W.

(4) Messrs. P. S. King & Son, 9, Bridge Street, Westminster, S. W., London.

(5) Mr B. H. Blackwell, 50 and 51, Broad Street, Oxford

(6) Messrs. Deighton Bell & Co., Limited, Cambridge.

(7) Messrs. Henry S. King & Co., 65, Cornhill, E. C., London

(8) Messrs. Grindlay & Co., 54, Parliament Street, S. W. London.

(9) Messrs. W. Thacker & Co., 2, Creed Lane, London, E. C.

(10) Messrs. Luzac & Co., 46, Great Russell Street, London, W. C.

(11) Mr. J. Fisher Unwin, Limited 1 Adelphie Terrace, London, W. C

(12) Messrs. William Wesley & Son, 28, Essex Street, Strand London.

Agents on the Continent of Europe.

(1) M. Ernest Leroux, 28, Rue Bonaparte, Paris.

(2) Martinus Nijhoff, The Hague.

(3) Messrs. Oliver and Boyd, Tweedale Court, Edinburgh.

(4) Messrs. E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

SHILLONG:

PRINTED BY H. H. KING, PRESS SUPERINTENDENT, ASSAM.

V 1 4 2

No. IXA—4520.

FROM

J. McSWINEY, Esq., M.A., I.C.S.,

DIRECTOR, DEPARTMENT OF LAND RECORDS
AND AGRICULTURE, ASSAM,

To

THE CHIEF SECRETARY TO THE CHIEF COMMISSIONER
OF ASSAM.

Dated Shillong, the 14th September 1918.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1918.

I have the honour to be,

SIR,

Your most obedient Servant,

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

[Prescribed maximum length—12 pages.]

CONTENTS.

SECRETARIAT
BOMBAY
LIBRARY

CHAPTER I.

ADMINISTRATION.

	Paras.
Director	1
Members of the Superior Staff	2
Subordinate establishment	3
Expenditure and receipts	4

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study in schools	5
Apprentices on Government Farms	6
Sabour Agricultural College	7

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—Agriculture.

Experiment stations	8
Soil investigation	9
Sugarcane	10
Sugarcane cultivation by steam tackle	11
Rice	12
Potatoes	13
Jute	14
Green manure crops	15
Fodder crops	16
Fruit	17
SECTION II.—Agricultural Chemistry ...	18
SECTION III.—Entomology	19

CHAPTER IV.

DISSEMINATION.

SECTION I.—Demonstration.

Localities	20
Rice	21
Potatoes	22
Sugarcane	23
Jute	24
Terrace cultivation	25
Minor demonstrations	26
Demonstrations by Honorary Correspondents	27

SECTION II.—Aid to the Public.

Seed supply	28
Agricultural shows and exhibitions	29

CHAPTER V.

OPERATIONS FOR THE IMPROVEMENT OF LIVE-STOCK.

Cattle breeding	30

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

	Paras.
Agricultural publications	31
Supply of information	32

CHAPTER VIII.

MISCELLANEOUS.

Weaving	33
General progress	34
Notice of services	35
Year of report	36
List of Honorary Correspondents and Associates	Appendix I.
Statement of receipts and expenditure	„ II.
Glossary	„ III.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending the 30th June 1918.

CHAPTER I.

ADMINISTRATION.

Director.

I continued in charge of the Department throughout the year and spent 160 days on tour. I inspected all the farms and paid several special visits to Kamrup, where a factory for the manufacture of sugar was erected by the cane contractor. I also attended the meeting of the Board of Agriculture at Poona in December and the Industrial Commission at Shillong in January.

Expert staff.

2. Mr. Meggitt worked as Deputy Director of Agriculture, Assam Valley, in addition to his charge as Agricultural Chemist. He was on tour for 117 days, including his work as Agricultural Chemist. During the year he attended the meeting of the Board of Agriculture at Poona. The Jorhat and Kamrup farms and demonstration work in Sibsagar and Nowgong were under his charge: he also controlled the work of the Entomological Assistant. With a view to enabling Mr. Meggitt to devote more of his time to laboratory research and analytical work he has since been relieved of entomological and purely agricultural work except the two farms at Jorhat and Kamrup.

Mr. McKay, Deputy Director of Agriculture, Surma Valley, held charge of the Karimganj and Upper Shillong farms and demonstration work in the Surma Valley, Kamrup, Garo Hills, Khasi and Jaintia Hills and North-East Frontier. He also controlled the work of the Weaving Master and the Seed Depôt at Gauhati. Mr. McKay was on tour for 256 days, including a visit to Naga Hills to study local terrace cultivation. He also went to the Dacca farm to consult with the Botanist to the Bengal Government regarding the selection of pure strains of rice, on which we are at work at the Karimganj farm. Since the close of the year he has taken charge of all the Provincial agricultural work except the Jorhat and Kamrup farms and of the Entomological Assistant.

Provincial establishment.

3. Maulvi Fazlul Huq and Srijut Lakeshar Barthakur were Superintendents of Agriculture in the Assam and Surma Valleys, respectively. The former was on tour for 246 days and the latter for 241 days; their time was devoted chiefly to organising and supervising demonstrations and visiting the honorary correspondents of the Department.

Mr. Chaston continued as Manager of the Kamrup farm and Mr. Holder in charge of the Shillong fruit station. Srijut Binaram Das, Babu Surendra Nath Gupta and U Herrick Singh remained as Managers of the farms at Jorhat, Karimganj and Upper Shillong, respectively.

Babus Satyendra Chandra Datta and Benode Behari Das, Srijuts Golok Chandra Bora, Lalit Mohan Das and Debi Prosad Gohain and U Hari Singh held the posts of Agricultural Inspectors in Kamrup, Sylhet, Nowgong, Karimganj and Cachar, Sibsagar and the Khasi and Jaintia and Garo Hills, respectively. Since the close of the year four additional Inspectors, making a total of ten, have been appointed on probation and placed under the existing Agricultural Inspectors for training. Babu Satya Ranjan Gupta continued to be the Entomological Assistant. Mr. Smith held the post of Agricultural Adviser at Sadiya.

During the year 20 demonstrators were employed, of whom 8 were attached to the Assam Valley plains, 7 to Surma Valley plains, 3 to Khasi and Jaintia Hills, 1 to Garo Hills and 1 to North Cachar Hills. There are two Agricultural Instructors in the Lushai Hills and two demonstrators in the North-East Frontier. Two temporary demonstrators were employed on terrace cultivation in the Naga Hills.

Expenditure and receipts.

4. The expenditure of the Department during the agricultural year ending on 30th June 1918 amounted to Rs. 2,48,092-14-9 and the receipts including advance payments to Rs. 37,722-1-10 against Rs. 2,21,459-10-10. and Rs. 12,238-5-0, respectively, for the previous year. The principal heads of receipts and expenditure are shewn in Appendix II. The amounts spent during the year for the Agricultural Chemist's laboratory fittings and the Kamrup farm were mainly responsible for the increased expenditure. The increase in sale-proceeds is largely due to the fact that a sum of Rs. 24,563, of which Rs. 22,500 was in advance, was realized during the year as the price of cane supplied to the cane contractor on the Kamrup farm for the manufacture of *gur* and sugar.

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study and agricultural education in schools.

5. Work in regard to nature study and agricultural education in schools has proceeded on the same lines as during past years and there is nothing new to record. The subject of agricultural instruction generally among the cultivating classes was discussed at the last meeting of the Board of Agriculture and the opinions of the Director of Public Instruction and myself have been submitted. Different views are held as to the possibility of improving agricultural practices in the field by imparting instruction to boys in schools. Whatever the ultimate decision may be, I think that Assam can well wait to see results in other more advanced and wealthier provinces.

Apprentices on Government farms.

6. With a view to providing demonstrators for field work apprentices are trained at each of the Government farms. The training lasts two years and is thoroughly practical. At the close of the year there were 8 apprentices at the Jorhat farm and 5 at Karimganj, while the Upper Shillong and the Shillong Fruit Experiment station each had two. In the Lushai Hills 3 boys were under the instruction of the Assistant Agricultural Instructor, but I am doubtful of the results, as we have not taken charge of this district and the local staff are anything but proficient.

Sabour College.

7. Students from Assam who desire higher training in agriculture attend the Bihar College at Sabour, where we have four scholarships of Rs. 20 per month for inhabitants of this province. Candidates are first tested and trained on a farm for a year during which time they receive Rs. 15 per month.

Out of the five stipendiaries in the third and second years of the college who appeared in the last final examination, four passed successfully and were appointed on probation as Agricultural Inspectors. Two private students were also successful in the final examination. During the year scholarships were granted to the four apprentice candidates from Jorhat and Karimganj farms. A Muhammadan from the Assam Valley, who was a stipendiary and failed in the last final examination, has been allowed to continue his stipend for another term in the college. Two Muhammadans from the Surma and Assam Valleys have been taken as apprentices at Karimganj and Jorhat farms, respectively, for the next year. We are short of Muhammadan candidates for the post of Inspector particularly in the Surma Valley, where the greater part of the cultivating population are followers of the Prophet. In view of the fact that posts of Agricultural Inspector are being filled up rapidly and there are only a few posts left, it will be impossible in future to take all passed candidates into Government service. At the close of the year, including the two scholars of 1917, there were ten students of the province in the college, *i.e.*, seven stipendiaries and three private students, who are more than enough for the present need of the Department. I have some hope that those who have received diplomas from the College will prove suitable for employment on tea gardens after a preliminary training, and I have written to the three branches of the Indian Tea Association bringing to their notice the names of the two successful private students of last year and pointing out the possibility of securing as assistant or under-managers men who have a training in practical agricultural methods. We have had some enquiries since the end of the year from managers.

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—AGRICULTURE.

Experiment stations.

8. There are five experiment stations in the province. The farms at Jorhat, Karimganj and Upper Shillong are mainly devoted to experiments with sugarcane, rice and potatoes, respectively, while that in Kamrup is for sugarcane cultivation on a factory scale with steam tackle. The fifth is the fruit experiment station at Shillong.

Soil investigation.

9. The various experiments at Jorhat on soil investigation and manurial tests, mostly having reference to the treatment of sour soils, were continued during the year and some interesting results have been obtained. With the recent completion of the laboratory Mr. Meggitt hopes to place the work on a better footing. There are five main lines of research (1) a liming experiment started in 1909, (2) a liming and manurial experiment started in 1911, (3) a wood ashes experiment started in 1911, (4) experiments to obtain the cause of the beneficial effect of lime on old alluvium and the action of various manures started in 1912 and (5) a ground limestone experiment started in 1913. Reference is invited to the Jorhat station report for details, but it may be noted here briefly that first experiment shows the residual effect of lime dressing after 9 years, the second brings out the great efficiency of organic manures, the third shows how the cultivator could improve his soil for cold weather cropping at small expense, the fourth continues to emphasise the evil effects of superphosphates on our sour soils without lime and the improvement that can be effected by good cultivation, drainage, and bulky organic manures even without lime, while the fifth has given somewhat contradictory results in the past year, which cannot be elucidated without a laboratory examination of the soil.

Sugarcane.

10. The sugarcane work at Jorhat include the testing of varieties, manurial experiments in the cane rotation, trials of different planting methods and the production of over a lakh of superior setts for distribution. Varieties tested against each other were the same as in previous years. Of the ratoons the old varieties, Striped Mauritius and B 376 did well, while B 147 is apparently losing its ratooning powers. Of the two new varieties, B 6450 gave a better crop then Barbadoes A with much higher sucrose content and purer juice, and compared very favourably with Striped Mauritius and B 376, which have constantly done well for years. The yield of plant cane was remarkably good in spite of the attack of fungus *melanconium sacchari*. The average yield for all varieties taken together was about 33·4 tons per acre, which constituted a record for the Jorhat farm : Barbadoes A gave 43 tons per acre, B 3412 gave 39·1 tons, Java 33 A 36·6 tons, and Striped Mauritius 35·7 tons : it is interesting to note that a *magh* sport gave 33 tons, while the local variety *magh* yielded only 24·4 tons. These results are most encouraging and show what can be done with cultivation, manuring and a proper rotation on a very bad soil, though cane is grown two years out of four on the same land. The highest yield of sucrose per acre in expressed juice was returned by Striped Mauritius with 3·5 tons, followed by B 6450 with 3·37 tons. The ripening season at Jorhat is generally unfavourable and better results are obtained with new varieties at Kamrup. The number of canes destroyed by *melanconium sacchari* was much greater in the phosphated area than in the non-phosphated. The planting experiment during the year provided for testing the value of wide *versus* narrow trenches on the Java model and of different disposition of the setts in both cases : the results were too close to permit of any deductions being drawn in regard to either. New varieties of cane were received from the Imperial Sugarcane Expert and other sources and have been multiplied in the nursery.

Sugarcane cultivation by steam tackle.

11. During the year the Kamrup farm entered upon the fourth year of the experiment proper. In spite of many difficulties met with in regard to the manufacturing side the cultivation work at the farm made much progress during the year. The area reclaimed and under cultivation at the close of the year was 817 acres in all, of which 503 acres were under cane, plant and ratoon. Planting of the new cane began towards the end of January, earlier than in former years, but was not finished until the end of April. In all some 233 acres of new cane were planted. The varieties under cultivation were Striped Mauritius and Barbadoes 147 and 376. The prospects of the crop up to the end of June were more favourable than in last year. The plant and ratoon crops of 1917 made good progress, but neither came up to the crops

of the previous year at the time the rains ceased. Owing to the very great delay in commencing milling it was imposible to weigh all the cane, but the average yield for the whole crop was estimated by weighments from each block at 15 tons per acre. The shortness of the crop is accounted for in part in the case of ratoons by the very late harvesting of the previous plant crop on account of the very late completion of the *gur* factory and in the case of the plant by the early summer drought. It is also and possibly mainly accounted for by the immediate planting of cane on land which was under howling jungle in the previous rains. On one block of 60 acres, which had been reclaimed one year previously and in the rains had been green manured with *dhaincha*, we got an average of 30 tons per acre, and some parts of it weighed out at over 34 tons. The results are due to our efforts to fulfil our agreement to supply our cane contractor and the very great delay, most of which was unavoidable, in the procuring and erection of machinery for sugar manufacture, which interfered with the cutting of the crop. Analyses made show that the ratoon crop was ready for milling early in December. The results of factory analysis made in March showed an average sucrose content of 13·76 per cent. on cane, but Mr. Meggitt considers this below the mark as the expression was only 64·3 per cent. against an expression of 70 per cent. from the same mills in the previous year. Mr. Maxwell, the cane contractor, converted his *gur* factory into a sugar factory, but there was very great delay in erection and no cane was milled before the end of February. Various defects in the running of the machinery together with the late start practically made the last season one of testing machinery. Only 390 tons of cane were dealt with in the factory, as compared with 775 tons last year: some of the remaining crop was used for planting or distributed and the remainder thrown away. With a view to bringing to a decisive issue the experiment on surgarcane cultivation by steam tackle and on a factory scale, it has been decided to retain the farm and renew our cane contract for a further period of five years from March 1919. A programme of planting, manurial and variety trials has been drawn up and, if the machinery of the factory proves satisfactory, there is no reason why we should not recoup the greater part, if not the whole of our expenditure from this on.

Rice.

12. The experiment in the pure line breeding of rice was continued in its fourth year at Karimganj. At first it was hoped to obtain definite results after 3 or 4 years' work, but the floods of 1915 and 1916 interfered to such an extent with the continuity of the experiments that a further period of a year or two will be required to obtain definite results. As in last year, the rice breeding experiments were restricted to the early *aus* and *sail* varieties. From the seeds obtained from the 57 types of early *aus* grown in 1915 further plots were sown. A few varieties which did well in 1916 gave a heavy outturn during the past year also, but no variety has yet proved to be sufficiently outstanding to justify any recommendation. For the purpose of type selection the experiment was commenced with the seeds of 104 varieties of *sail*, and a few additional types were included later. Mr. Hector's intervarietal selection and the testing of improved rices against local varieties were continued during the year. An experiment was conducted in the selection of paddy seeds by the specific gravity method. Another experiment was made to test the effect of bonemeal as manure for double crop rice land against no manure. The work at Karimganj requires meticulous accuracy of observation and extreme care at every step and great credit is due to Mr. McKay and the Farm Manager for the results so far. We are working on the general advice given by Mr. Hector, Botanist to the Bengal Government; we are very grateful for his assistance and advice, but it is clear that we should obtain earlier and more accurate results if we had a Botanist of our own.

Potatoes.

13. At Upper Shillong experiments with potatoes were continued. They included trials of varieties and of different seed rates. Of the 22 varieties tried in the previous year, 'Windsor Castle, 1909' was omitted and 'Arran Chief' and 'King of potatoes' were added. Of the old varieties, 'Windsor Castle, 1912' gave largest crop, while among the new crops, 'Edinburgh Castle, 1915' gave the highest yield. Potato blight caused by the fungus *phythophthora infestans* appeared in the farm as usual and the crop was carefully sprayed with Bordeaux mixture. The proportion of diseased tubers was smaller than in previous years and there is reason to believe that the use of Bordeaux mixture year after year has tended to reduce the extent of disease in the potato stocks of the farm. Seven new types of potato bred in 1914 were planted again for selection; as the varieties did not appear to be pure the experiment has been continued. Mr. Donald Ferguson's twenty lots of seed obtained from St. Andrew's University were tried for the third time and gave varying results. Of these lots two were destroyed by insects and one failed to form any tubers: the remaining 17

varieties have been planted on a larger scale. Six varieties were grown during the year for the purpose of seed. The average yield per acre amounted to a little over 3·2 tons. The total outturn of potatoes grown in 1917 was 58·39 tons, of which 31·93 tons were supplied for seed. There was extensive demand both from the hills and plains districts for sed potatoes grown on the Shillong farm.

Jute.

14. A varietal experiment with jute was continued at Karimganj. The three varieties tested against one another were the same as in previous years, *viz.*, Mr. Finlow's pure line breed, a variety obtained from Goalpara and a local variety. Mr. Finlow's variety gave the highest yield.

Green manure crops.

15. At Jorhat the experiment in the use of raw manurial phosphate in the sugarcane rotation, which commenced in 1913, was continued. It will be necessary to work through probably three rotations (12 years) before any general results can be announced. The rotation consists of 2 years of cane, a green crop of *dhaincha* followed by oats in the third year, and in the fourth year a green crop of cowpeas followed by a *catch* crop of rape ploughed in. Indigo and some other green crops were also tested. Cowpeas and *dhaincha* were grown as green manure crops at Karimganj and Kamrup.

Fodder crops.

16. At Upper Shillong maize, Job's tears and *raishan* were grown for fodder for the cattle herd. The first two are preserved in a silo and the last is made into hay. *Jowar* was tried at Karimganj. At Jorhat Guinea grass, Rhodes grass and *kheri* sugarcane have been planted this year for the first time : results will appear in future reports.

Fruit.

17. The Fruit experiment station at Shillong has continued to make satisfactory progress. The total area of the garden is 57·41 acres, and out of about 26 acres, which are suitable for fruit growing, 24¾ acres have been planted. Good fruit including numerous varieties of apples and pears has been produced and over Rs. 900 worth of fruits sold locally during the year. The results are promising.

Section II.—Agricultural Chemistry.

18. As indicated in last year the Agricultural Chemist was unable to pay attention to his legitimate work on account of the want of a fitted laboratory and distractions caused by the demonstration work in his charge. His laboratory was completely fitted in last April, but was not organised before the end of the year. Consequently beyond routine analytical control of cane work nothing was possible during the year under report. The resumption of this work at Jorhat, in addition to that at Kamrup, was however some advance on the previous year. Mr. Meggitt has now a considerable amount of field results which await laboratory examination and, in order to enable him to devote his attention to this, I have relieved him since the close of the year of all non-chemical work, except the charge of the Kamrup and Jorhat farms, which on account of sugarcane and soil investigations are closely allied with his work. The latter has been seriously impeded by the very great delay in, firstly, erecting and, secondly, completing the fittings of his laboratory. It was originally contemplated that Mr. Meggitt, on his taking up chemical work in Assam in March 1915, would then find a laboratory well on the way to completion : owing to some misunderstanding about the provision of funds before the war and their scarcity since and the need to supply the gap caused by Mr. Birt's departure early in 1915 for military duty, Mr. Meggitt has been cut off from his proper line of activity for nearly three years and a half. People with scientific leanings will understand what a loss this has been to him and to the general efficiency of the Department.

Section III.—Entomology.

19. Of rice pests the rice hispa (*hispa armigera*), rice bug (*leptocorisa varicornis*) and stem borer (*schænobius bipunctifer*) are the most common and serious pests. The hispa was not so common in the Surma Valley during the year and swarming caterpillars were also less serious. As usual, want of concerted action and natural difficulties made the results not encouraging from the cultivators' point of view. The mustard aphis caused considerable damage in both valleys : it was controlled in a small area by spraying with crude oil emulsion. Jute was effected by the Bihar hairy caterpillar (*diacusia obliqua*) and the jute semilooper (*cosmphila salutifera*) : partial success was obtained in control. Borers on cane are being kept under at Jorhat farm. Several new borers on trees of the citrus family have been sent to Pusa for identification, etc. The

Entomological Assistant is handicapped by want of room for a laboratory, which I hope will be remedied in the near future. He accompanied the Assistant of the Imperial Mycologist at Pusa, who visited some fruit gardens in the province with a view to investigating fruit pests. The Imperial Entomologist inspected the collection and records of the Entomlogical Assistant during the year, and investigated a number of new fruit pests in the Shillong experiment station.

Generally, it may be said that little results are obtained so far in the control of insect pests. The people believe that they come from the clouds and are a punishment from heaven. It will take many generations of education to eradicate these ideas. Personally, I think that this is the one line on which we could expect early results from agricultural or scientific teaching in village schools. Practical demonstration of the life histories of common pests would soon ensure that people would not look with mild amusement at the feeble efforts of our staff to catch the nimble *pok* by methods which appear to approximate to that of catching sparrows by putting salt on their tails.

CHAPTER IV.

DISSEMINATION.

SECTION I.—DEMONSTRATION.

Localities.

20. During the year demonstrations were carried out on cultivators' holdings under the general control of the Deputy Directors in the districts of Sylhet, Nowgong, Garo Hills and Khasi and Jaintia Hills. The work done consisted chiefly of manuring and variety demonstrations with rice and sugarcane, the introduction of improved varieties of jute, potatoes, and fodder crops, of the three-roller iron sugarcane mills and the Meston plough. In the plains the work of the Inspectors and demonstrators was under the immediate supervision of the Superintendents of Agriculture ; one Inspector directly under the Deputy Director of Agriculture is in charge of demonstrations in the Khasi and Jaintia and Garo Hills. Work in Naga and Lushai Hills is not directly under this department : in the former district it consists of introducing the Angami system of wet rice terraced cultivation amongst other tribes and depends for its efficacy on the moral suasion of the Deputy Commissioner on the more-well-to-do and on pecuniary assistance to the poorer people : the work done is according to reports well worth the money spent, in view of the increasing population, which results from *pax Britannica*, and the imminent shortage of land for cropping. In the Lushai Hills there does not appear to be much scope for terraced rice, nor apparently is there such need of it, but a fair amount of extension results annually : I am not so sure of the utility of the remaining work, except possibly the efforts to introduce oranges and potatoes : the local agricultural staff seem to be ignorant and there is a clear want of technical supervision. In the North-East Frontier we give advice when required : the Deputy Director of Agriculture visited Sadiya and the neighbourhood during the year and gave general lines of instruction to the Political Officer : terraced rice, potatoes, sugarcane and vegetables have been taken up and some attempt has been made at cattle breeding.

Rice.

21. In Sylhet and Cachar the same paddy manurial demonstrations were laid down this year. Bonemeal gave uniformly good results on over-cropped land. The residual effects of bonemeal applied in 1915 and 1916 and of *dhaincha* as green manure ploughed in 1916 were kept under observation during the year. Owing to the low price of paddy none of the demonstrations made for the first year showed sufficient profit this year to justify the expenditure on manures, but the results from plots kept under observation for several years show that there is considerable profit in the residual effects : for example, an average expenditure of Rs. 9 per acre increased the value of the outturn by Rs. 28 or 300 per cent. profit, while an expenditure of less than two rupees on *dhaincha* gave a return of over Rs. 30. In Kamrup also bonemeal manuring demonstrations kept under observation for the second and third years showed a marked increase in yield ; the first year's crop from a plot redressed after three years gave an increase of 619 lbs. per acre. Demonstrations of green manuring alone and with bonemeal gave considerable increases in yield over that of the untreated plots. In Sibsagar demonstrations with bonemeal for the third year showed an average increase of 174 lbs. grain per acre : the total net profit for the three years of the demonstration amounts to Rs. 18-6-0 against an initial outlay of Rs. 9 per acre.

Demonstrations with bonemeal and flour phosphate were carried out in Sibsagar for the second year and gave an average increase of 102 and 150 lbs. of grain, respectively : the net profit for two years was Re. 1-12-0 for the former and Rs. 6-10-0 for the latter. These results again confirm the previous experience in Sibsagar that

phosphate gives a better result than bonemeal for paddy. The results of demonstrations made in certain centres in the use of phosphate with and without green manures showed that phosphate in some form is the prime requirement of the paddy crop in Sibsagar.

In Nowgong some manurial demonstrations were laid down this year for the first time.

In the Khasi Hills the majority of rice growers having realized the value of bonemeal for wet-land paddy, demonstration work on this crop underwent a considerable reduction. We obtained from Calcutta and sold no less than 42½ tons or 1,200 maunds at an average price of Rs. 5 per maund in this district during the year, besides 3¼ tons crushed at the Upper Shillong farm. New work was undertaken in two centres only and the net profit was about Rs. 3 per acre for the first year. The total net profit for the second and third years of demonstration was Rs. 14 and Rs. 25, respectively. Demonstrations with bonemeal for up land paddy were also carried out during the year : the results showed that 247 lbs. of bonemeal produced an extra crop of 351 lbs. of grain which is not sufficient to pay the initial cost of manure. A demonstration was made to observe the residual effect of a second dressing of bonemeal applied three years after the first dressing and the result showed a profit of Rs. 14-8-0 per acre in the two years following the second application.

Potatoes.

22. Demonstrations in growing superior varieties of potatoes obtained from Shillong against the local seed were made in Sylhet, Kamrup, Nowgong and Sibsagar. The results showed an increase of crop in favour of the Shillong seed. In Sibsagar the average increase was 2·3 tons per acre valued at Rs. 131 ; in Kamrup it was 1·6 tons valued at Rs. 100, while in Sylhet the increase was 870 lbs. per acre. In the Khasi and Jaintia Hills demonstrations in potato cultivation were made in fourteen centres, of which five were in Jowai, where potatoes are not yet much cultivated : the results were promising and the demonstrations have been continued. Five depôts were opened in this district for the sale of seed potatoes and 5·13 tons were sold during the year : this is exclusive of the quantity (11 tons) sold in the plains through the seed depôt. Potato cultivation experiments were carried out on a small scale in the Garo and Lushai Hills. In the Naga Hills potatoes were cultivated in both subdivisions and yielded a good crop. seeds were distributed for further trial.

Sugarcane.

23. Demonstrations with our superior varieties of cane against the local ones were undertaken in Sibsagar, Kamrup, and Sylhet, and in all cases an increase in yield resulted from the Jorhat varieties. The demand for setts of superior varieties was very great during the year. Some 309,000 setts were supplied in Sibsagar, 114,000 in Kamrup, 18,000 in Nowgong and 15,500 in Sylhet for the purpose of demonstration work and for distribution amongst the cultivators. In the North-East Frontier 4,000 cuttings were obtained from Jorhat farm and planted during the year.

The three-roller iron sugarcane mills have already secured a hold on public appreciation. Demonstrations with these mills were made with success. As the price is now very exhorbitant, only 4 mills were sold in Sylhet and 8 in Sibsagaa.

Jute.

24. The Finlow variety was demonstrated against local seed with good results in Sylhet and Kamrup. In order to meet the local demand for seed, arrangements were made to ensure the return of seed equivalent to the quantity given out to the cultivators. We have since arranged with Messrs. Birkmyre Bros. to be supplied with a large quantity of seed from their plantation at Kumarikhata in Kamrup next year as the supply from Bengal was limited.

Terrace cultivation.

25. In the Naga Hills terraces were made in new localities and considerable extensions were made to old terraces. The crop reaped during the year was better than in the previous year. In the Lushai Hills 722 terraces were made in 19 houses in Aijal and 15 terraces in 23 houses in Lungleh during the year. In the North-East Frontier demonstrations of wet rice cultivation were continued at Kotung and Passighat, but there does not seem to be any great attraction on the part of the local population for the labour of terracing.

Minor demonstrations.

26. *Paddy.*—Demonstrations of Mr. Hector's *Indrasail* and Srijut Narayan Barua's George *sali* proved both to be heavier croppers than the local varieties. *Boro* paddy was grown successfully in Kamrup and Nowgong. In Garo Hills demonstration was made with Khasi paddy for hill and wet lands.

Fruit.—Some 200 orange seedlings were issued in the North Cachar Hills for demonstration and about 250 seedlings were distributed in the Lushai Hills. Grafting and budding demonstrations were continued in the Khasi Hills. The importance of fruit in the latter district and Sylhet has enabled us to secure the appointment of one Inspector for this work for the province since the close of the year.

Cotton.—Garo cotton was supplied on demand in Kamrup and was tried without much success in Khasi and Jaintia Hills and North Cachar. Our experience of this crop is that the climate in the plains is too damp for ripening and what is grown in the hills is generally sold to be used as an adulterant of wool : it is very coarse and short-stapled. In view of numerous enquiries regarding cotton cultivation we issued during the year a leaflet showing our experiences to date. There seems to be very considerable ignorance of the climatic requirements of the crop, and spasmodic efforts to procure a local supply to counteract the high prices of yarn and cloth are undoubtedly doomed to failure.

Fodder.—Jowar was grown for fodder in Sylhet and Kamrup, but it is doubtful if the labour entailed will appeal to the cultivator. With a view to take a comprehensive view of the fodder problem a survey of fodder crops in the Surma Valley was made by the Superintendent of Agriculture and copies have been supplied to the Commissioner and the Deputy Commissioners of that Valley.

Improved implements.—The use of Meston ploughs was demonstrated in Sylhet Kamrup, Sibsagar, Nowgong, and Khasi Hills.

Conservation of cattle manure.—The construction of model manure pits was continued in Sylhet, Kamrup, Nowgong and Sibsagar, where 215 pits were made during the year.

Demonstrations by Honorary Correspondents.

27. At the close of the year there were 34 Honorary Correspondents against 33 in the previous year. A list of these correspondents is appended to this report.

It would assist us and the province materially if we had more genuine correspondents who would be prepared to work actively in even small ways. For instance, the cultivation of cane and jute for seed would cost a correspondent little, his share being the loan of a small plot of land and the labour of cultivation. We are very struck with the need of local centres of seed supply even now and this will increase when we can produce good rice seed. No more valuable service can be rendered to the people by gentlemen of public spirit than assistance to our Department in this way. We have several most useful helpers, but we want many more : the only criterion is that we want genuine assistance shown practically.

Srijuts Deveswar Borthakur and Deveswar Goswami, who have been extensively cultivating the improved Jorhat varieties of canes for some years, distributed large numbers of cuttings to cultivators. Maulvi Zubaid Ali Hazarika was very successful with Shillong potatoes. He also grew George *sali* and Barbadoes canes. Babu Jnan Chandra Roy considerably extended the cultivation of Barbadoes canes, which have been giving uniformly good results. He also distributed number of cuttings to the villagers. Babu Joynath Nandi continued to encourage potato cultivation in his locality with good results. He also assisted in the preparation and collection of water Hyacinth ash and its application as manure for jute. Mr. Gilman continued his endeavours to popularize the system of two crop paddy cultivation among his own raiyats and neighbours. Mr. D. Ferguson and Babu Lalit Mohan Datta of Dhubri tried *Kakaya Bombai* jute with good results.

SECTION II.—Aid to public.

Seed supply.

28. During the year the seed depôt at Gauhati supplied about 11 tons of Shillong seed potatoes, 1·5 tons of paddy seed and 125,000 cane setts (from Kamrup farm) ; jute, cotton, maize, oats, pulse and groundnut were the most important of other seeds issued. Altogether 13 sugarcane mills, 33 Meston ploughs and a few other agricultural implements were sold : owing to the increase in the price of sugarcane mills and implements, the demand was less than in previous years. The demand for seeds has, however, steadily increased and there is considerable room for further development. The Local Administration has sanctioned an extra grant of Rs. 10,000 for opening a second depôt at Sylhet and for the enlargement of the scope of the existing one at Gauhati : arrangements

have been made to give effect to these proposals. A set of rules of business has been submitted for approval. We have also obtained the sanction of the Government of India to follow the Bengal practice of crediting sale-proceeds against expenditure: as we hope to make the depôts in a large measure self-supporting, this concession should enable us to expand our activities without causing a considerable drain on funds.

The bone-grinding installation at the Upper Shillong farm continued to work during the year. Some 6·32 tons of bones were crushed and yielded about 5·67 tons of bonemeal. As already explained in order to meet the extensive demand, 40·36 tons more were obtained from Calcutta: it is gratifying to note that the cultivators paid in cash the full price for the quantity 46 tons purchased and that there were no bad debts.

During the year the Agricultural Inspector, Khasi Hills, supplied to the public 18 lbs. of Garo cotton seed, 80 lbs. of paddy seeds, 8½ lbs. of coffee seed, more than 2,000 orange seedlings, 4,500 suckers of Wahjain pineapple and 2 Meston ploughs.

Agricultural shows and exhibitions.

29. The annual Shillong agricultural show was held in September. There were large number of exhibits especially in the field crops and other agricultural products. A weaving demonstration and exhibition of cloth formed a part of the show. We think that interesting and popular as the show has been we should properly obtain better results from the money spent by non-spectacular work in the villages: this conclusion is a result of war economy.

CHAPTER V.

OPERATIONS FOR THE IMPROVEMENT OF LIVE-STOCK.

Cattle breeding.

30. The herd of Patna and cross bred cattle, which is maintained at the Upper Shillong farm, numbered 100 at the close of the year against 97 in the preceding year. Two young bulls were purchased during the year from Pusa for breeding purposes. Four young bulls and 2 heifers of the farm stock were sold to the public and 1 bull was sent to the Karimganj farm. The demand for bulls still far exceeds the supply. The total yield of milk during the year amounted to 3,487 gallons, of which 15 gallons were fed to calves and the remainder was sold at the rate of 14 lbs. per rupee. The cost of the maintenance of the herd was Rs. 3,015 against Rs. 3,712 in the previous year, while the income from milk amounted to Rs. 2,101 against Rs. 1,854 and the value of cattle sold to Rs. 226 against Rs. 327, so that the nett cost was Rs. 1,688 against Rs. 1,931.

The fine stock of milch cattle in the farm is the result of many years of work. They have proved remarkably well adapted to the climate of the Khasi Hills and in their milking capacity are far superior to anything on this side of India. Both Superintendent of the Veterinary Department and the Director of Agriculture, Bengal, inspected the herd and expressed their satisfaction at our results.

Our difficulty has been to maintain the herd pure owing to the failure of repeated efforts to obtain new bulls through the Agricultural Department, Behar: we hope to be able to obtain one or two soon by direct purchase. The bulls we received from Pusa are of different breeds and did not come up to our expectations.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Agricultural publications.

31. Two leaflets on "Water Hyacinth" and "Cotton in Assam" were published in the course of the year. Besides the reports on the work of each agricultural station and on agricultural demonstrations, which are published annually in the autumn, two quinquennial reports on wages census and experimental harvestings were issued during the year.

Supply of information.

32. Many requests for information relating to agriculture, fruit culture, sericulture and industries in the province were received from private individuals and concerns and complied with. Honorary correspondents were supplied free with copies of all departmental publications and reports and were given information and advice on agricultural matters.

CHAPTER VII.

MISCELLANEOUS.

Weaving.

33. Babu Nani Gopal Mitra, Weaving Master, spent 279 days on tour, during which he visited almost all the weaving centres in the province, gave practical instructions in improved methods and organized co-operative societies. As a result of his demonstrations the use of improved looms and warping mills was introduced in various places, including a few tea gardens, whose managers exhibited a keen interest in this work.

The Weaving Master was given the status of Inspector of Co-operative Societies and during the year he organised 8 Weavers' Societies, half in either valley. It is gratifying to note that the Weavers' Society at Beani Bazar in Sylhet was able to sell Rs. 2,000 worth of cloth to Dewan tea estate in Cachar.

The high prices of clothes have caused so great an increase in the demands for the services of the Weaving Master during the year, that it was not practicable for the department to comply with the requests of all, more especially as he had to work single handed. At the close of the year an order has been issued to transfer the Weaving Master to the Industries Department, when started: it is clearly impossible for the Agricultural Department with the many legitimate demands on it and the shortness of its superior staff to devote adequate attention to working out an enlarged scheme for the development of local weaving. In the meantime Rai Bahadur Kanak Lal Barua has been placed on special duty in connection with the development of weaving and Mr. Abinash Chandra Dutta, Sub-Deputy Collector, who held a State scholarship in England for weaving, has been placed under him.

General progress.

34. Last year I gave a short resumé of the progress of the department from 1912 and need do little more now than note what has been done in the past year. I must, however, again emphasise the fact that we are short-handed in our superior staff. Mr. Meggitt must now devote himself to chemical work and Mr. McKay has the sole charge of demonstration work throughout the province, besides two farms. Rice breeding urgently demands the services of a whole-time Botanist. Demonstrations cannot be adequately controlled by one Deputy Director, no matter how energetic he may be, and the pity of it is that we want more control now because our staff of Inspectors is new and inexperienced and the people are still suspicious of efforts to improve them without some ulterior motive. I must repeat that, even when Mr. Birt returns to us, we shall want two more Deputy Directors at least: by that time or soon after it is probable that the department will be under an officer of the Indian Agricultural Service and the question will arise whether he will be able to perform the duties of a Deputy Director as well as his own as Director. Then there is the eternal question of cattle breeding, which will never, in my opinion, be properly tackled until we follow the example of Madras and appoint a whole-time man for it.

The suggestion made in my report of last year to call a halt to the expansion of our subordinate staff was accepted and we have sent only two scholars to Sabour in this year. But with four recent appointments of Inspectors we have very nearly reached the danger point of extension until we are given more Deputy Directors, and indeed, we can go on only in the expectation of early relief. The work during the year has proceeded on the usual lines and we are extending the use of good varieties of sugarcane, potatoes, jute and rice, but the latter is still on a small scale. Potatoes have so expanded in the Khasi Hills that the question of their transport by road to Gauhati is becoming a formidable problem. For sugarcane we want a large number of small local centres for growing canes for setts and here we should be glad of assistance from private sympathisers. A good deal continues to be done with bone-meal and green manuring for rice, but so far we have had notable success only in the Khasi Hills. The demand for seeds has compelled us to expand the one seed depôt into two and now we have one in either valley. I think that in view of the newness of our subordinate staff and the strain put on the superior staff, we can claim to have made considerable progress during the year. The appearance of "Water Hyacinth" in the Surma Valley has given us an opportunity of useful work; we must follow what is being done in Bengal, as we have no staff of our own to investigate. We burned enough to make 100 maunds of ash and purchased 36 maunds from people whom we instructed: 70 maunds were sent to Calcutta and since the close of the year an unsatisfactory analysis was received. This was due at least in part to our late start and we hope to do better this year. It is not impossible that this plague may eventually prove a blessing in supplying a local source of potash.

I should like to emphasise, not for the first time, the absolute necessity of taking action in agricultural matters only on technical advice. I speak not as an authority, but as a convert by experience. We constantly find intelligent people deluding themselves with the idea that there is little or nothing to be learned in agriculture and acting on very superficial experience. For instance, though it is true that almost any crop can be grown in this province, particularly in the Assam Valley, it does not follow that it will ripen or that, when it is taken up on a large scale, the seasons will allow the preliminary cultivation required. I have referred to the prevailing ideas regarding cotton growing. I could mention a number of instances of excellent intentions unfortunately based on ignorance, but their inclusion in a public report would hardly be appropriate. The general ideas prevailing regarding cattle breeding and the methods of improvement are in many cases deplorable. I do not claim that our department is infallible, but it has a fair amount of accumulated knowledge and some experience. On the other hand, the cultivator will not take up new methods or crops until he is convinced beyond all possibility of doubt that he is going to do better and without too much extra expenditure of labour or money. Hence if progress seems slow, we would ask for patience. Our staff have made a considerable advance: the pace will increase with more adequate supervision of experiment and demonstration and with, we hope, the growing confidence of the raiyat in our endeavours.

Notice of Services.

35. Mr. Meggitt, Agricultural Chemist, continued to work mainly as Deputy Director but, as the report shows, carried on the field work of his chemical investigations with success; his work in future will be more congenial and, with a laboratory, more profitable to the province. Mr. McKay was most energetic and has taken on further tasks, being now solely in charge of demonstration work: he also supervised weaving with success. Messrs. Holder and Chaston continue to give satisfaction in the Shillong fruit station and Kamrup sugarcane farm. M. Fazlul Huq and Srijut Lakeshwar Barthakur, Superintendents of Agriculture, have done well: in view of the large number of Muhammadan cultivators in the Surma Valley they have been mutually transferred and the latter is now in the Assam Valley. Srijut Binaram Das and Babu Surendra Nath Gupta, managers of the farms at Jorhat and Karimganj, have worked hard and conscientiously. Of the Inspectors Babu Satyendra Chandra Dutta in Kamrup rendered excellent service: U Hari Singh in the Khasi Hills deserves credit for the extensive sale of bonemeal and Srijut Lalit Mohan Das in Karimganj and Cachar was careful in supervision. Babu Satya Ranjan Gupta, Entomological Assistant, did his best under difficulties. The Weaving Master, Babu Nani Gopal Mitra, who is by now transferred from our department, was energetic and achieved some very good results during the year. My Head Assistant Babu Dinesh Chandra Das has been very helpful, as usual.

Year of report.

36. All our departmental reports are for the year ending 30th June which covers part of two seasons, with the result that for one crop two reports have to be consulted: it is unnecessary to refer to the trouble of compilation. Our agricultural year begins in April and now that the Bengal Government have altered their agricultural reports to the year ending 31st March, I think that we may well follow their example and thus ensure a logical and convenient period of review.

SHILLONG:
The 14th September 1918.

J. McSWINEY,
Director of Land Records and Agriculture, Assam.

APPENDIX I.

List of Honorary Correspondents of the Department of Agriculture in Assam.

SYLHET.

1. D. Ferguson, Esq., Dhamai Tea Estate, Post Office, Dakhinbag.
2. Babu Girija Nath Biswas, Post Office Baniachang.
3. „ Mahananda Bhattacharya, Post Office Pail, Habiganj.
4. „ Pavitra Nath Das, Post Office Beani Bazar.
5. „ Raj Kumar Nandi, Sylhet.
6. „ Bidya Kumar Chowdhuri, Sunamganj.
7. Maulvi A. M. Chowdhury, Zamindar, Kanihati, Post Office Hazipur, South Sylhet.
8. „ Abdur Rahim Chowdhury, Zamindar, village Sultanpur, Post Office Jalalpur, Sylhet.
9. James Laurie, Esq., Post Office Nariancherra, Akbarpur, Queen Pine Apple Estate, South Sylhet.
10. Babu Joynath Nandi Mazumdar, Post Office Bejura, Habiganj.
11. Maulvi Syed Bashirul Haque Chowdhury, Post Office Patharia, village Bhatipara, police station Derai.

CACHAR.

12. Babu Sarada Charan Chakarvarty, B.A., Assistant Inspector of Schools, Silchar.
13. „ Bharat Chandra Das Chowdhury, Salchapra, Cachar.

KHASI AND JAINTIA HILLS.

14. U Job Solomon, Shillong.
15. U Kubur Singh, Mylliem.
16. U Bordhon Roy Kanti, Mahadev, Cherrapunjee.
17. U MacDonald Gatphoh, Jowai.

GOALPARA.

18. Babu Dijesh Chandra Chakravarti, Manager, Gauripore Estate.
19. „ Lalit Mohan Datta, Dhubri.

KAMRUP.

20. E. P. R. Gilman, Esq., Parduar Tea Estate, Post Office Palasbari, Kamrup.
21. Munshi Kaymubir Rahman, Gauhati.
22. „ Tayab Ali, Sonapur, Kamrup.
23. Srijut Pratab Narain Chowdhury, Mauzadar, Khata, Nalbari.

DARRANG.

24. Babu Jatindra Chandra Maitra, Tezpur.

NOWGONG.

25. Babu Jnan Chandra Ray, Baithulongso, Post Office Kampur.

SIBSAGAR.

26. Srijut Deveswar Sarma Barthakur, Thakurbari Farm, Post Office Haloguri.
27. „ Deveswar Gossain, Barpathar Sugarcane Farm, Post Office Badlipur (Golaghat).
28. „ Narayan Chandra Barua, Nakachari, Lahing, Jorhat.

LAKHIMPUR.

29. Srijut Pithambar Saikia, Mauzadar, Khowang, Post Office Khowang.
30. „ Baikuntha Narayan Baruah, Panitola Post Office.
31. Maulvi Zubaidali Hazarika, North Lakhimpur.

NAGA HILLS.

32. Dr. J. Riley Bailey, Mokokchang.

GARO HILLS.

33. Babu Bishnu Charan Datta, Superintendent, Deputy Commissioner's Office, Tura.

RANCHI.

34. Rai Bhupal Chandra Basu Bahadur, B.A., M.R.A.C., M.R.A.S.

APPENDIX II.

Statement showing the receipts and expenditure of the Department of Agriculture for the year ending the 30th June 1918.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
(*a*) Sale of Manure and farm produce ...	33,985 1 10	(1) Superintendence	49,922 11 4
(*b*) Potatoes	955 8 9	(2) Agricultural instruction ...	3,789 9 6
(*c*) Other receipts	1,843 9 3	(3) Agricultural Chemist ...	28,046 3 9
(*d*) Receipts from Seed Depôt ...	937 14 0	(4) Experiment Stations	1,53,122 6 9
		(5) Agricultural Demonstrations and Experiments.	12,723 5 11
		(6) Public Exhibition and Fairs ...	336 4 6
		(7) Poultry breeding operation ...	152 5 0
Total receipts	37,722 1 10	Total expenditure ...	2,48,092 14 9

APPENDIX III.

Glossary.

Kheri }	Local variety of surgarcane.
Magh }	
Aus	Autumn rice.
Sail or Sali	Transplanted winter rice.
Dhaincha	Sesbania Aculeata.
Raishan	Paspalum Sanguinak.
Boro	Spring rice.
Cowpea	Vigna Catiang.

A. S. P. O. (E. & A.) No. 48—400—29-10-1918—A. E. R.

Resolution on the Agricultural Department Report of Assam for 1917-18.

Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 4073R., dated the 28th October 1918.

READ—

The Report of the Department of Agriculture, Assam, for the year ending 30th June 1918.

RESOLUTION.

THE Chief Commissioner has read with much interest the account of the year's work of the Agricultural Department. The work consists mainly in the agricultural experiments conducted at the farms at Jorhat, Karimganj and Upper Shillong, the demonstration on the Kamrup sugarcane plantation of the possibility of growing sugarcane on a commercial scale, the demonstration in villages of the advantages of manuring and of the cultivation of improved varieties of staple crops, and the distribution of selected seed and sugarcane setts. Progress necessarily is slow, but, as the Director points out, the cultivator will not take up new methods or crops until he is convinced beyond all possibility of doubt that he is to do better and without much extra expenditure on labour or money. Still there is progress, and the Department is accumulating proofs of the advantages of expert direction and of the necessity for such direction, and the Chief Commissioner considers that the staff are to be congratulated on what they have accomplished in the face of many difficulties. The Director sounds again the note of warning of the danger of extending operations too fast without adequate supervision. The number of demonstrators has now risen to 20, and 4 additional Inspectors were appointed during the year, making a total of 10; but all the work except that of the Chemist and of the Kamrup and Jorhat Farms is under a single Deputy Director. The Chief Commissioner recognises the need for increasing the Directorate, and one of the first steps to be taken when a return to normal conditions makes it possible is to secure agricultural experts to strengthen the superior staff. Until this has been done it will not be wise materially to increase the number of Inspectors and Demonstrators. The number of Assamese students receiving diplomas from the Sabour Agricultural College in the near future is likely to be in excess of the number of Government posts available, and the Chief Commissioner trusts that tea planters and other landholders will find use for them. In the meantime a separate Department of "Industries" has been formed, which will relieve the Director of Agriculture of some work, including the supervision of weaving.

2. The question of establishing special agricultural schools came before the Local Administration, and it was decided that Assam would do best to wait and see the results of the experiments that are being made in Bengal and elsewhere. The Director's suggestion for introducing some form of practical demonstration of the life histories of common insect pests in the ordinary rural schools will be considered further, but it is necessary to guard against overloading the syllabus of primary schools.

3. The results obtained from the sugarcane plantation in Kamrup were disappointing. The delay in working off last year's crop interfered with ratooning, and on the whole neither the outturn of cane nor its sucrose contents were as good as in the preceding year. This appears to be due in part to the immediate planting of cane on land which had only just been cleared and cultivated, and the fact that lands which had been reclaimed a year before planting and had been green manured gave an average of 30 tons per acre over a block of 60 acres shows what may be expected of the farm when it has been thoroughly cultivated. There were 503 acres under cane and it had been hoped that the crop would be worked off by the factory, and the whole or at least the greater part of the expenditure on the farm recouped; but from various causes the mill owner was unable to deal with more than a minute fraction of the cane grown. Most of it was wasted, and a very heavy loss incurred. The white

sugar factory is now complete, and a fresh agreement for 6 years has been entered into. This was necessary to complete the demonstration and the possibility of growing successive crops of cane under the rotation system worked out by the Agricultural officers. Now that the sugar mill is in working order it is hoped that the payments received for the cane will balance the expenditure on the farm.

4. The demand for seed potatoes from the Shillong Farm, and for sugarcane setts from Jorhat and Kamrup shows that the public appreciate the results obtained on these farms. The ultimate value of bonemeal and phosphate as manures was demonstrated both on the farms and in the villages. It was found that in Sibsagar phosphates are the chief requirements of paddy. The benefit of bonemeal appears chiefly in its residual effects, and in the Khasi Hills at least its value as a manure for wet land paddy has been recognised, as some 1,300 maunds were sold at an average price of Rs. 5 per maund.

The need of a botanist has been much felt at the Karimganj Farm where the experiments in producing pure varieties of paddy have been hampered by successive floods, and no very definite results have been obtained.

5. The steps to be taken for the improvement of cattle in Assam were considered carefully by the Local Administration, and it has been decided that all that can be attempted at present is to import suitable sires from the Bengal Cattle Farm, and to form local committees of persons interested in cattle-breeding to promote selective breeding, better feeding, and better treatment. It is feared that progress must be slow and little can be accomplished until the cultivator is educated to realise that it is unprofitable to keep a large number of weedy cattle that are of little use either for the plough or for giving milk. An interesting note on the cattle fodders of the Surma Valley was prepared by Srijut L. Barthakur, Superintendent of Agriculture, and the subject clearly will repay further examination.

6. The spread of the water hyacinth in the tributaries of the Megna presents a formidable problem. The Agricultural Department are doing their best to combat the pest by showing how it can be profitably converted into ash which will make a valuable manure. It is to be hoped that the people at large will realise that it is to their profit individually to collect all the water hyacinth in their neighbourhood and convert it into ash. If it is left to spread unchecked, it will soon choke all the tanks, hollows and waterways of the province, with results that are serious to contemplate.

7. The fruit garden in Shillong did well, and Rs. 900 worth of fresh fruit was sold.

Arrangements have been made to enlarge the Gauhati seed depôt, and open a second depôt at Sylhet, and under the new financial system the operations of these depôts will no longer be restricted by budget limits.

8. The Chief Commissioner's thanks are due to those gentlemen who have helped the Department in its experiments. Such help is most useful, and more of it is needed. Mr. Beatson Bell is sure that there must be many gentlemen in the province interested in agriculture who will be glad to give such practical assistance as is required and he hopes they will come forward. Mr. McSwiney is to be congratulated on his successful administration of the Department, and the names of the officers commended by him have been noted. Mr. McKay has had a most onerous task, having taken on, in addition to his duties in the Surma Valley, the supervision of demonstrasions in the Assam Valley and that of weaving. Mr. Meggitt took up work outside his proper sphere to set a colleague free for war work. Now that his laboratory has been completed, and that he has been relieved of his duties in connection with demonstration work in the field, he will have more leisure to devote to chemical investigations.

ORDERED that a copy of this Resolution and of the Report be published in the *Assam Gazette* for general information.

By order of the Chief Commissioner of Assam,

J. E. WEBSTER,

Chief Secretary to the Chief Commissioner of Assam.

A. S. P. O. (R. & Agri.) No. 48—400—29-10-1918—A. E. R

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Period from 1st July 1918 to 31st March 1919.

BY

J. McSWINEY, Esq., I.C.S.,
DIRECTOR, DEPARTMENT OF LAND RECORDS AND AGRICULTURE, ASSAM.

SHILLONG:
PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1919.

Price 9d.] [*Price 8 annas.*

Agents for the sale of Books published by the Assam Administration.

Agents in India.

(1) Messrs. Thacker, Spink & Co., Calcutta.

(2) Messrs. W. Newman & Co., Calcutta.

(3) Messrs. S. K. Lahiri & Co., Calcutta.

(4) Messrs. A. M. and J. Ferguson, Ceylon.

(5) Messrs. R. Cambray & Co., 6 and 8/2, Hastings Street Calcutta.

(6) Messrs. Thompson & Co., Madras.

(7) Babu Hari Ram Dhar, B.A., Popular Library, Dacca.

(8) Messrs. D. B. Taraporevala Sons & Co., 103 Meadon Street Fort, Post Box No. 187. Bombay.

(9) The Indian School Supply Depôt, 309, Bow Bazar Street, Calcutta.

(10) Messrs. M. C. Sircar & Sons, 75, Harison Road, Calcutta.

(11) Messrs. Students & Co., Cooch Bihar.

(12) Messrs. Vas & Co., Madras.

(13) The Standard Literature Co. Limited, 23-1, Old Court House Street, Calcutta,

(14) The Standard Book Stall, Karachi.

15. Mr. Mangaldas Harkisandas, Surat.

Agents in England.

(1) Messrs. Constable & Co., 10, Orange Street, Leicester Square, W. C.

(2) Messrs. Kegan Paul, Trench, Trübner & Co., 68—74, Carter Lane, E. C., London, Oriental Department, 25, Museum Street, London, W. C.

(3) Mr. B. Quaritch, 11, Grafton Street, New Bond Street, W.

(4) Messrs. P. S. King & Son, 9, Bridge Street, Westminster, S. W., London.

(5) Mr B .H. Blackwell, 50 and 51, Broad Street, Oxford.

(6) Messrs. Deighton Bell & Co., Limited, Cambridge.

(7) Messrs. Henry S. King & Co., 65, Cornhill, E. C., London.

(8) Messrs. Grindlay & Co., 54, Parliament Street, S. W. London.

(9) Messrs. W. Thacker & Co., 2, Creed Lane, London, E. C.

(10) Messrs. Luzac & Co., 46, Great Russell Street, London, W. C.

(11) Mr. J. Fisher Unwin, Limited 1 Adelphie Terrace, London, W. C.

(12) Messrs. William Wesley & Son, 28, Essex Street, Strand, London.

Agents on the Continent of Europe.

(1) M. Ernest Leroux, 28, Rue Bonaparte, Paris.

(2) Martinus Nijhoff, The Hague.

(5) Messrs. Oliver and Boyd, Tweedale Court, Edinburgh.

(4) Messrs. E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

SHILLONG:

PRINTED BY H. H. KING PRESS SUPERINTENDENT, ASSAM.

No. IXA—1-2417.

FROM

J. McSWINEY, Esq., I.C.S.,

DIRECTOR OF LAND RECORDS AND AGRICULTURE, ASSAM,

To

THE CHIEF SECRETARY TO THE CHIEF COMMISSIONER OF ASSAM.

Shillong, the 16th June 1919.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the period from 1st July 1918 to 31st March 1919. This is the first report according to the altered date and the period under review this year is, therefore, one of nine months.

I have the honour to be,

SIR,

Your most obedient Servant,

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

[Prescribed maximum length—12 pages.]

CONTENTS.

	Para.
Introductory	1

CHAPTER I.

ADMINISTRATION.

Director	2
Expert Staff	3
Provincial establishment	4
Expenditure and receipts	5

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study and Agricultural education in schools	6
Apprentices on Government Farms	7
Sabour Agricultural College	8

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—Agriculture.

Experiment Stations	9
Soil investigations	10
Sugarcane	11
Sugarcane cultivation by steam tackle	12
Rice	13
Potatoes	14
Jute	15
Pulse crops	16
Green manure crops	17
Fodder crops	18
Fruit	19
SECTION II.—Agricultural chemistry...	20
SECTION III.—Entomolgy ...	21

CHAPTER IV.

DEMONSTRATION.

Localities	22
Rice	23
Potatoes	24
Sugarcane	25
Jute	26
Water Hyacinth	27
Terrace cultivation	28
Minor demonstrations	29
Demonstrations by Honorary Correspondents	30

CHAPTER V.

SUPPLIES OF SEEDS, MANURES AND IMPLEMENTS.

	Para.
General	31
Gauhati Seed Depôt	32
Sylhet Seed Depôt	33

CHAPTER VI.

Cattle breeding	34

CHAPTER VII.

MISCELLANEOUS.

General progress	35
Notice of services	36
	APPENDIX.
List of Honorary correspondents	I
Statement of receipts and expenditure	II
Glossary	III

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Period from 1st July 1918 to 31st March 1919.

INTRODUCTORY.

The last report submitted was for the year ending 30th June 1918. In view of the fact that this date happens to be in the middle of the agricultural season and with the object of securing the coincidence of the period of the report with that of the season the date has been changed to the 31st of March. The present report thus relates to the period of nine months from the 1st July 1918 to the 31st March 1919 and deals only with agriculture, as the sericultural and weaving branches have since been transferred to the Department of Industries.

CHAPTER I.

ADMINISTRATION.

Director.

2. I remained in charge of the department throughout the period under report and spent 145 days on tour. I inspected all the farms and paid several visits to the Kamrup farm. I attended the meeting of the Franchise Committee in Calcutta as official representative from Assam, and also went to Dacca in connection with the spread of water hyacinth in Sylhet.

Expert staff.

3. Mr. Meggitt, Agricultural Chemist, acted as Deputy Director, Assam Valley, in addition to his own duties till the end of August 1918, when Mr. McKay in addition to his own charge as Deputy Director, Surma Valley, took over from him the control of seed depôt at Gauhati and district demonstration work in the Assam Valley, leaving Jorhat and Kamrup farms under Mr. Meggitt. Mr. Birt returned from military service on February 13th after an absence of nearly four years and resumed his duties as Deputy Director, Assam Valley.

Mr. Meggitt was on tour for 64 days and visited the Kamrup farm several times. He also attended the sectional meeting of Agricultural Chemists at Pusa. Mr. McKay was on tour for 175 days. He visited Patna and Sonepur in Bihar for the purchase of two Patna bulls for the Upper Shillong farm and accompanied me to Dacca in connection with the water hyacinth question. He controlled sericulture and weaving till the end of September 1918, when these were transferred to the Director of Industries. During the period of one month and a half Mr. Birt spent 38 days on tour. It is with regret I am to note that Mr. McKay has since resigned the Indian Agricultural Service: Mr. J. N. Chakrabarty, a Superintendent of Agriculture from Bengal, has been appointed to act as Deputy Director and placed in charge of the Surma Valley and Hill Districts. Owing to ill-health Mr. Birt has also been compelled to proceed on long leave and Srijut Lakheswar Barthakur, Superintendent of Agriculture in the Assam Valley, will be appointed to act in his place.

Provincial Establishment.

4. Maulvi Fazlul Huq and Srijut Lakheswar Barthakur continued to be the Superintendents of Agriculture in the Assam and Surma Valleys, respectively, until September 1918, when they were mutually transferred. The former was on tour for 152 days and the latter 167 days; their time was devoted chiefly to organizing and supervising seed depôts and demonstrations and visiting the Honorary Correspondents of the Department. Srijut Lakheswar Barthakur was engaged for some time in the Surma Valley in connection with the experimental work on water hyacinth to ascertain the value of its ashes as manure. He also enquired into the possibility of *Boro* cultivation in the Majuli tract in Sibsagar.

Mr. Chaston continued as Manager of the Kamrup farm and Mr. Holder in charge of the Shillong fruit station. The farms at Jorhat, Karimganj and Upper Shillong are in charge of three managers and there is an Entomological Assistant for the Province.

The addition of four Agricultural Inspectors to the district staff fell within the period under review. Two more posts have been sanctioned bringing up the total number of Inspectors to 13, including the Fruit Inspector and the Agricultural Assistant at Sadiya. The two new probationers under training being posted to district work, there will remain Darrang and two subdivisions of Sylhet to be provided with Inspectors under the scheme outlined in 1914.

During the year 25 demonstrators were employed, of whom 12 were attached to the Assam Valley plains, 7 to the Surma Valley plains, 4 to the Khasi and Jaintia Hills, 1 to the Garo Hills and 1 to the North Cachar Hills. There were also two demonstrators each in the Lushai and Naga Hills and the Sadiya frontier tract.

Expenditure and receipts.

5. The expenditure of the department during the financial year ending 31st March 1919 amounted to Rs. 2,45,298-6-5 and the receipts including those of the seed depôts to Rs. 22,336-8-6 against Rs. 2,55,690-7-5 and Rs. 35,800-2-8, respectively, for the year 1917-18. The financial heads of receipts and expenditure are shewn in Appendix II. The decrease in receipts is due to the fact that last year's receipts included the amount of Rs. 22,500 realized in advance for the price of cane supplied to the cane contractor on the Kamrup farm for the manufacture of sugar. There was a total receipt of Rs. 10,596-13-6 against the expenditure of Rs. 14,195-5-7 on account of the purchase of seeds, plants, manures and implements in the seed depôts at Gauhati and Sylhet. The decrease in expenditure was due to the completion of the fittings of the Jorhat laboratory, which cost Rs. 15,383-5-0 in the previous year.

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study and agricultural education in schools.

6. Work in regard to nature study and agricultural education in schools has proceeded on the same lines as during past years and there is nothing new to record.

Apprentices on Government farms.

7. In view of the need for demonstrators the Department trains a certain number of apprentices at each of the Government farms. The training lasts two years and is thoroughly practical. At the close of the year there were four apprentices at the Karimganj farm and six at Jorhat, while the Upper Shillong and fruit station each had two. An apprentice on Rs. 10 per mensem has been sanctioned for the Lushai Hills.

Sabour Agricultural College.

8. Students from Assam who desire higher training in agriculture attend the Bihar College at Sabour where scholarships of Rs. 20 per month are given to inhabitants of this province. Candidates are first tested and trained on a farm for a year during which time they receive Rs. 15 per month. During the year scholarships were granted to the four apprentice candidates from Jorhat and Karimganj farms. A Muhammadan scholar from the Assam Valley, who failed in the final examination of 1918, was allowed to continue his stipend for another term in the College. In view of the fact that there are only a few posts of Agricultural Inspectors left and that there were not sufficient Muhammadan candidates for the posts, the Local Administration reduced the number of stipends and limited the grant of the same to qualified Muhammadans only. Accordingly two were selected from the Surma and Assam Valleys as apprentices, and of these the former did not join the Karimganj farm, while the latter after a year's training at Jorhat has proved unfit for the agricultural stipend at Sabour. Out of the three scholars of the second year and four of the first year two have passed the final examination and three have been promoted to the second year class of the College. The two failed stipendiaries were Muhammadan youths of the two classes, and the one in the second year has been allowed to continue his stipend for another year. At the close of the year there were only four scholars of the province in the second year, as none could be sent this year. Applications have been invited with a view to select another Muhammadan candidate for training this year. My efforts to secure posts for passed students from the College on tea gardens failed. There is thus no employment or scope for these young men outside the Department and in my opinion it is worse than useless to grant any more scholarships at Sabour than are required to fill up our staff.

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—AGRICULTURE.

Experiment stations.

9. There are five experiment stations in the province. The farms at Jorhat, Karimganj and Upper Shillong are mainly devoted to experiments with sugarcane, rice and potatoes, respectively, while that in Kamrup is for sugarcane cultivation on a factory scale with steam tackle. The fifth is the fruit experiment station at Shillong.

Soil investigations.

10. The experiments at Jorhat were continued on the lines indicated in previous reports. With regard to the liming experiment on Block C no figures are available this year owing to an attack of disease on the soybeans with which the land was cropped, but notes made on the crop earlier in the season tend to confirm the results of last year in favour of lighter and more frequent dressing of lime rather than larger and less frequent applications. In the experiment with ground limestone deep cultivation on the more heavily limed plot showed a beneficial effect in the case of the oat crop. This is difficult to explain in view of the results obtained in previous years, but the unusual dryness of the season is probably sufficient to account for it. The experiments on Block K show the effects of various manures on limed and unlimed land. The results obtained in this experiment year after year emphasize the great value of lime and phosphoric acid (more particularly in its basic forms) on this soil, and the markedly deleterious effect of sulphate of ammonia without lime in some form. All these experiments have now reached the stage when further progress will depend largely on laboratory work on the soil, and this is now being taken up by the Agricultural Chemist.

Sugarcane.

11. The work on sugarcane at Jorhat includes the testing of varieties under chemical control, manurial experiments in the cane rotation, trials of various methods of planting and the distribution of the best varieties to cultivators. The season was not very favourable for cane, the rainy season being cooler and wetter than usual, followed by a long drought in the cold weather. Of the ratoons, one of the older varieties, Striped Mauritius, did best with a yield of 29·5 tons of cane per acre; B-376 was a little below its average owing probably to an attack of *melanconium sacchari* last year; B-147 will probably have to be abandoned for a ratoon crop, as it appears to be steadily losing its ratooning power. Of the newer varieties Barbadoes A, B-3412 and J. 33a gave heavy crops, but their juices are of comparatively low quality. J. 33a is the best of the three and in view of its hardiness would appear to be a suitable variety for small cultivators. The local varieties *magh* and *magh sport* compared very unfavourably with all the introduced varieties. The average crop of plant cane was 27·5 tons per acre against 33·4 tons in the previous year. The fall in outturn is attributed to the comparatively unfavourable season. Satisfactory evidence of the soundness of the rotation is gained from the fact that four years ago, when this land was last under plant cane, the average crop was only 22·5 tons per acre. The average yields on both the phosphate and non-phosphate areas were B-3412, 36·2 tons, B-376, 34·6 tons, Barbadoes A, 32·5 tons, Striped Mauritius, 32·1 tons and J. 33a, 30·5 tons per acre. The standard local variety *magh* averaged only 19·7 tons per acre. With regard to quality, Striped Mauritius B·376 and B-147 maintained their usual high positions; B-3412 and Barbadoes A, while yielding heavy crops of cane, proved comparatively poor in sugar content. White Mauritius, a sport of Striped Mauritius, did very well both as regards quantity and quality. In the ratoons the crop on the phosphate area was less by about 2 tons per acre than on the non-phosphate area, which is accounted for by the severe attack of disease on the phosphate area last year. In the case of the plant cane the average increase of crop due to phosphate was about 3 tons of cane per acre. In the planting experiment no very conclusive results were arrived at, but there is some indication that there is little or no advantage in making the trenches more than a foot wide. A number of new varieties were grown in the nursery for propagation and preliminary trials: of these, several show much promise—notably Purple Mauritius, D-74 and C. 6 and 9.

Sugarcane cultivation by steam tackle.

12. The experiment in growing sugarcane on a large scale for the manufacture of white sugar was continued. No new land was broken up during the period under report; thus the total area under cultivation remains the same as reported last year, *viz.*, 817 acres. Of this 493 acres were under sugarcane, ratoon cane 263·

acres and plant cane 230 acres. It is doubtful whether the present area under cultivation is capable of extension unless the steam tackle is augmented by the addition of extra power implements. Enquiries have been made about suitable motor tractors which will relieve the steam tackle of some of the lighter work of cultivation on the land already reclaimed and set it free for the rougher work of breaking up new land for which it is particularly suitable.

The season was not so favourable for sugarcane as usual, the rainfall being badly distributed. An unusually wet rains was followed by a long period of drought lasting from October till March. While this facilitated the preparation of the land for the crop to be planted in the spring of 1919, the cane crops on the land at the time were checked and growth ceased earlier than usual, with the result that the outturn did not come up to expectations.

The factory commenced milling operations on the 28th December 1918 and it was anticipated that the whole of the crop would be worked off by the end of March, but owing to defects it worked only intermittently and dealt with only 1,572 tons of cane up to the 31st March. Since then it has taken 283 tons bringing up the total cane milled to date to 1,855 tons. When it was realized that there was practically no hope of the factory being able to deal with the whole of the crop, it was decided to go on harvesting the plant cane, whether the factory could take it or not, in order to give the young ratoons a chance, and thus large quantities of our best cane again had to be thrown away. Consequently it was impossible to weigh the whole of the crop, but in order to form an estimate of this, representative areas, usually an acre in extent, were marked out in each block and weighed. The estimates given for the crop are thus partly based on actual weighments of cane supplied to the factory and partly on weighments of small representative areas. In this way it is estimated that the plant cane gave an average outturn of 18·4 tons of cane per acre, while that of the ratoon cane was only 4 tons per acre. The plant cane varied from 26·3 tons per acre on a block which had been reclaimed a year in advance to about 9 tons on land which had been put under cane immediately after being broken up. This confirms previous years' experience that, in order to get good results, land should be broken up at least a year previous to planting. The ratoons gave a miserable crop, but ratoon here have never yet had a fair chance owing to the previous crop of plant cane having been removed so late in the season.

The varieties grown were, as in previous years, Striped Mauritius, B. 376 and B 147. In addition to these fifteen new varieties were planted in a nursery and thirteen of these have been planted out in the field this year for a preliminary trial. With regard to quality of cane the average results for the whole milling season were :— *expression* (juice on cane) 61·1 per cent, *sucrose in juice* 17·09 per cent, *sucrose in bagasse* 7·66 per cent, *purity co-efficient of juice* 87·2 per cent, *fibre in cane* 13·65 per cent, and *sucrose in cane* 13·42 per cent. With regard to these the Agricultural Chemist remarks that " it is not desired to lay too much stress on these figures, as on many occasions the cane lay about the factory yard for some days before being milled, and would not be improved as a consequence."

The area under cane at present is 469 acres, of which 239 acres are plant cane planted from January to March 1919, and the remainder ratoons of the 1918 crop of plant cane. The germination of the plant cane was somewhat retarded by the drought in the spring ; otherwise at the end of the period under report there was every prospect of this year's crop, both plant and ratoon, being successful. Since then however a beetle pest has appeared on the farm which has done very serious damage to the ratoon and also to some extent to the plant cane. Little could be done to check the ravages of this insect as it works entirely underground and is reported to be an unknown pest on sugarcane. An Entomologist from Pusa together with our own Entomological Assistant have been making investigations, and it is hoped that some practical method of control of the pest will be discovered in order to prevent damage in future. At the time of writing it is reported that the beetles have practically disappeared from the plant cane, which is now showing signs of recovering from the attack, but that the condition of the ratoon crop is still very bad.

Rice.

13. Rice selection work was continued for the fifth year at the Karimganj farm Single pure line selections from 56 varieties of *aus* and from 109 varieties of *sail* were grown on the farm for comparison. The Economic Botanist, Bengal, visited the farm in November 1918. He assisted in selecting from the *sail* varieties, advised on the general work, and

expressed satisfaction with the progress made up to date. In the present year three of the most promising selections of *aus* and four of *sail* are receiving an exhaustive test against a standard type in each case, so that a definite selection may be made from among them at next harvest.

The testing of improved varieties against local varieties on a field scale was continued, as were also the effect of bonemeal and green manure on the rice crops. *Indra sail* from Bengal and *George sail* from Assam continued to show marked superiority to local varieties.

High floods interfered to some extent with the non-experimental paddy crop on the farm, but from experience gained in previous years the farm staff succeeded in safeguarding all experimental plots. As an insurance against flood damage, experiments were tried with late transplanted varieties and with varieties requiring deeper water than these usually grown on the farm and both proved successful.

Potatoes.

14. The acclimatizing, testing, and distribution of potatoes continue to be the principal work of the Upper Shillong farm. Altogether 23 varieties were under test in the past season. King of Potatoes, Magnum Bonum, Windsor Castle, and Imperator still continue to give the heaviest yields on the farm. Owing to transit difficulties, very few new varieties could be imported during the war period. With the return to more normal conditions in the present year three new varieties have been obtained from Messrs. Sutton and Sons, England, and are now under trial. In the main crop varieties were grown on a large scale for distribution of seed to Khasi cultivators and 7 tons were distributed in the hills. There is a great demand, both from hills and plains districts for seed potatoes from the Shillong farm. In order to meet this demand as far as possible, it is proposed to distribute farm-grown seeds to Khasi cultivators, who will undertake to keep the seed pure and to return from the crop one and a half times as much as the seed supplied. As an experimental measure a further quantity of 5 tons has been distributed for the present crop under this scheme.

Jute.

15. The Bengal variety, *Kakaya Bambai*, was again tested at the Karimganj farm against one of the heaviest cropping local varieties, and it continued to show its superiority. A manurial test was carried out on this crop with bonemeal, ground limestone, and hyacinth ash. These manures were applied along with cattle manure, singly and in combination. Each manure showed a profitable increase in outturn of fibre.

Pulse crops.

16. Eight varieties were grown on small plots at Jorhat. In the case of five varieties early sowing gave the best result, while late sowings did best in the case of the remaining three varieties. The most promising results were obtained from the Rangoon bean (*Phaseolus Lunatus*) and from Keshari. The Rangoon bean, which has a high value on the British market, will be tried on a field scale next cold weather.

Green manure crops.

17. At Jorhat green manuring with cowpeas and dhaincha is practised regularly in the rotation with excellent results. The rotation consists of two years of sugarcane, dhaincha for green manure followed by oats in the third year, and cowpeas for green manure in the fourth year followed by a catch crop of rape ploughed in. Under this system cane is grown regularly two years out of four and the soil, which was originally very poor, is being gradually improved, as witnessed by the increase in the crops of cane when the land comes under this crop again. Green manuring with cowpeas and dhaincha was also tried on the Kamrup sugarcane farm, but owing to the difficulty of ploughing in cowpeas in the absence of more suitable implements, our attention this year is being confined to dhaincha. Dhaincha and cowpea were tried as green manure crops at Karimganj; the former has proved more successful; than the latter. Manuring and seed-sprouting experiments were conducted on the potato crop at the Upper Shillong farm. The latter has proved an economical method of preserving seed potatoes.

Fodder crops.

18. At Jorhat an experiment was commenced with Kheri cane, Guinea grass and Rhodes grass for fodder on small areas of about $\frac{1}{10}$ acre each. Kheri cane was planted in the spring, Guinea grass from roots in June, and Rhodes grass grown from seed was planted out in August. The total amounts of green fodder obtained up till 31st March were Guinea grass 23·5 tons per acre, Rhodes grass 14·2 tons per acre, and Kheri cane 14·1 tons per acre. Guinea grass gave four cuttings from August to November,

but growth was then stopped by drought and the fifth cutting was not obtained until March after rain. Rhodes grass, which is much finer than Guinea grass, stood the drought better and gave six cuttings, two of which were in December and February. As it was grown from seed, it got a late start as compared with Guinea grass, but as a cold weather fodder crop it has shown much promise. The areas under these grasses are being extended.

At Upper Shillong *Raishan* is grown for hay and maize and Job's tears for silage. These make excellent fodders for cattle. At Karimganj farm jowar proved unsuccessful as a fodder crop, owing to heavy rainfall immediately after sowing.

Fruit.

19. The Fruit experiment station at Shillong has continued to make satisfactory progress. The total area of the garden is 62 acres, and out of about 30 acres, which are suitable for fruit growing, 23·75 acres have been planted. Good fruit, including numerous varieties of apples and pears, has been produced and about Rs. 900 worth of fruit was sold locally during the year. Arrangements are being made to have grafts supplied from the station for use in the Khasi and Jaintia Hills. The results are promising.

SECTION II.—AGRICULTURAL CHEMISTRY.

20. Consequent upon his being relieved of demonstration work the Agricultural Chemist was able to give somewhat more time to his proper duties. The charge of the two farms at Kamrup and Jorhat, which he retained up to the end of the year, proved however a considerable distraction. The laboratory was organised and work gradually taken up, most of it being of a routine nature, considerable arrears having accumulated during the five years or thereabouts in which from various courses not under his control laboratory work has been impossible. Chemical control of the sugarcane work both in Kamrup and at Jorhat occupied the greater portion of his time during the cold weather months. Mr. Meggitt continued to give his close personal attention to the introduction, acclimatisation and testing of new varieties of sugarcane ; the time devoted to this work is well spent, as the improvement of the class of canes grown forms the very foundation of any considerable advance in the sugarcane industry. In connection with this aspect of his work a special study of certain cane diseases which appeared for the first time had to be made. By way of preventive measures a campaign against borer was undertaken and a rigid system of selection of all varieties was instituted. Research work on the changes taking place in different parts of the cane throughout the ripening period was taken up, and some interesting results obtained. This is being extended.

In connection with his soil investigations Mr. Meggitt continued the permanent field experiments at Jorhat. Laboratory work in this connection was only resumed at the end of the year. For the proper development of this work further field experiments are necessary. By way of standardisation the uniform cropping of possible areas during the year for this purpose did not offer much encouragement, the crops indicating extremely uneven conditions of fertility. This will hamper the work.

Work on two other subsidiary lines which it is hoped to develop in the future, *viz.*, pulses and fodder crops, was taken up during the year.

SECTION III.—ENTOMOLOGY.

21. The Entomological Assistant was on tour for 153 days chiefly in Kamrup, Nowgong, Sibsagar and Sylhet districts. He also attended the third conference of Entomologists at Pusa.

A brief account of his work is given below :—

(1) *Paddy pests*—Rice hispa (*Hispa armigera*), Rice stem borer (*Schoenobius bipunctifer*), Rice bug (*Leptocorisa varicornis*), Swarming caterpillars (*Spodoptera mauritia and prodenia*), and the army worm (*cirphis sp*) caused serious damage in both valleys. In the case of hispa and stem borer no remedial or preventive measures could be attempted, but operations against swarming caterpillars by means of a net dragged over the

field are reported to have met with some success, especially in Kamrup; and in the same district near Digaru attacks of army worms were controlled by dragging ropes over the crops and by placing heaps of grass in the fields to act as traps. In the case of attacks of rice bugs at Nalbari bagging is reported as having proved effective.

Of minor pests, rice case worm (*Nymphuta epunctalis*) was reported from Kamrup, Sibsagar, Nowgong, Sylhet and the Khasi and Jaintia Hills districts, and a mealy bug (*Ripersia Sacchari*) from Karimganj. The former was checked by brushing the pest off the crop by means of a rope dragged over the field, having first used kerosine oil to form a thin film on the surface of the water, and in some cases, where convenient, by letting the water out of the fields, and in the case of the latter pest, the removal and burning of the infested patches was recommended.

(2) *Pests of oilseed crops.*—The mustard sawfly (*Athalia proxima*) was checked at Jorhat farm and in some villages near Gauhati by dusting the crop in the early morning, when the plants were wet with dew, with a mixture of powdered soil and lime sprinkled with kerosine oil. At Jorhat farm a crop of soy beans was infested with a Buprestid grub not yet identified. Specimens have been sent to Pusa and an attempt to rear the insect is being made by the Entomological Assistant.

(3) *Sugarcane pests.*—Systematic operations against cane borers were carried out on Jorhat farm throughout the year with considerable success. The new species of borer (*Dialria sp*) remained active, breeding throughout the season.

(4) *Fibre crop pests.*—The Bihar hairy caterpillar (*diacrisia obliqua*) was reported to be damaging jute in Kamrup, Nowgong and Karimganj. Handpicking of conspicuous egg masses and clusters of young caterpillars was recommended. Crickets were reported from Nowgong and Sylhet as damaging young jute seedlings.

(5) *Potato and vegetable pests.*—Cut worms and red ants did considerable damage to the potato crop in the plains. In the Khasi Hills and Haflong in North Cachar cantharid beetles were reported as having attacked the summer crop of potatoes. Cutworms were also, as usual, troublesome in their attacks on the young seedlings of many other vegetables.

(6) *Fruit pests.*—In addition to the unidentified species investigated last year, a pentatomid bug (*Rhynchoris sp*) caused damage to orange fruits in Sylhet and Kamrup, and a mite damaging lichi trees was reported from Dibrugarh. The former suck the juice of the green fruit and either cause it to fall off or, if the fruit remains on the bough, cause the pulp to become hard and dry. It was noticed in one orchard that tree ants (*Oecophyta smaragdina*) were feeding on this pest and keeping it in check. In some places the people trap the bugs by means of a stick coated with gum. In the case of the mite attacking lichis, removal of infested leaves and spraying with crude oil emulsion were recommended.

As a preventive against mealy bug (*Monophlebas sp*), which attacks orange plants, on a few gardens in Sylhet the base of the trees and the immediate surroundings were kept clean with the result that, where this was done, the trees were free from the bugs. The practice common in Sylhet of heaping half rotted cowdung round the base of the trees, which provides favourable conditions for the bug to breed, was discouraged everywhere.

The above is a brief account of the pests reported on by the Entomological Assistant during the year under report. His work also included additions to his collections and the rearing of hitherto unidentified species. He was greatly handicapped by want of a suitable laboratory and also because his headquarters being at Gauhati where there is no Government farm, he was unable to devote uninterrupted study to many of the pests reported on. Since the close of the year his headquarters have been removed to the Jorhat farm, where a room is being fitted up as a temporary laboratory, which will serve until the proposed extensions to the existing chemical laboratory have been made, and where he will be able to study and control the pests of the farm and the immediate neighbourhood.

The whole question of the control of insect pests is one of extreme difficulty, and little progress is possible until the ordinary cultivator becomes more enlightened as to the causeof these visitations. Hitherto our one Entomological Assistant has been largely employed in dashing about to various places whence attacks have been reported

and giving advice and assistance as far as possible in each locality. These efforts, scattered as they are over a whole province with its various conditions of climate and cultivation, have necessarily had little effect. However, with the gradual establishment of a staff of demonstrators under the charge of an Inspector in each district, we hope in time to arouse the cultivators to carry out by combined effort some of the preventive and remedial measures against the most common pests which the Entomological Assistant has proved effective by experiment.

CHAPTER IV.

DEMONSTRATION.

Localities.

22. During the year demonstrations on cultivators' holdings were carried out under the general supervision of the Deputy Directors in all the plains districts of the province except Darrang, where no Agricultural Inspector has been posted, and in the Khasi and Jaintia, Garo Hills and North Cachar Hills. In the Sadiya frontier tract the agricultural assistant works under the orders of the Political Officer and advice is given by the Deputy Director when required. In the plains the work of the demonstrators and Inspectors was under the immediate control of the two Superintendents. The Khasi and Jaintia Hills, North Cachar Hills and Garo Hills are in charge of one Inspector each directly under the Deputy Director. The work in the Naga and Lushai Hills, which consists mainly in extending terrace cultivation, is not directly under this department.

The work done during the year consisted chiefly in variety and manurial demonstrations with rice and sugarcane, the introduction of improved varieties of potatoes and jute, three-roller iron sugarcane mills, Meston ploughs and the system of storing cattle manure in covered pits and sheds. In Sadiya varieties of crops including sugarcane, potatoes, *aus* paddy and wheat were grown successfully, while terracing for wet rice cultivation produced excellent results at Pasighat and Rotung.

Rice.

23. In the Assam Valley in Sibsagar and Kamrup the residual effect of manures in the third year after application was recorded. In Sibsagar the average increase due to bonemeal was 423 lbs. per acre and to flour phosphate 137 lbs. per acre. The total increase for the three years was 709 lbs. per acre for bonemeal and 542 lbs. for flour phosphate. The financial results show a profit of Rs. 17 per acre for bonemeal and Rs. 9-8-0 per acre for flour phosphate. In Kamrup bonemeal *plus* green manuring with dhaincha gave an average increase of 548 lbs. per acre against only 142 lbs. for green manure alone, the total average increase for the three years amounting to 1,344 lbs. per acre for bonemeal *plus* green manure, and 284 lbs. for green manure alone. The profit in the first case was Rs. 38 per acre as against Rs. 8 in the latter.

In the same two districts the results of the residual effect of manures in the second year after application were also recorded. In the first series in Sibsagar bonemeal gave an average increase of 343 lbs. per acre, flour phosphate 261 lbs., bonemeal *plus* green manure 340 lbs., flour phosphate *plus* green manure 311 lbs. and green manure alone *minus* 41 lbs. For the two years the total average increase was for bonemeal 1,195 lbs., flour phosphate 1,263 lbs, bonemeal *plus* green manure 1,210 lbs., flour phosphate *plus* green manure 1,033 lbs. and for green manure alone 275 lbs. This shows a profit on the two years of Rs. 36 per acre for bonemeal, Rs. 36-12-0 for flour phosphate, and Rs. 8-8-0 per acre for green manure alone, while, when bonemeal and flour phosphate are used in conjunction with green manure, the profit is reduced to Rs. 24-6-0 and Rs 26-4-0, respectively. These results are very difficult to explain and, in view of previous experience, cannot be regarded as in any way conclusive. In the second series, also in Sibsagar, bonemeal gave an average increase of 209 lbs. per acre and flour phosphate 262 lbs., the total average increase for the two years being 531 lbs. for bonemeal and 482 lbs. for flour phosphate. This shows an average profit of Rs. 11 per acre for bonemeal and Rs. 7-8-0 for flour phosphate. In the third series laid down in Kamrup bonemeal *plus* green manure gave a total increase in the two years of 818 lbs. per acre against 429 lbs. for green manure alone, resulting in a profit of Rs. 19-12-0 per acre for the former as against Rs. 14 for the latter. The results, however, were irregular in the second year, as in two centres green manure alone gave a heavier yield than when bonemeal was added. At three centres in Kamrup rape cake gave an average increase over no manure plots of 762 lbs. per acre, or a nett profit of Rs. 18 per acre for the two years. All the second year demonstrations are being kept under observation with a view to recording results in the third year.

New manurial demonstrations laid down in 1918 on the same lines have not given a sufficient increase in the first year to pay for the manures applied with the exception of oilcake. The effect of the phosphatic manures, however, should be apparent for at least three years, and the plots will be kept under observation for this period. The demonstrations undertaken in the past few years have proved that phosphate in some form will give profitable results as a manure for paddy in the long run, and also that the crop can be considerably improved at a small cost by the practice of green manuring. It must be confessed, however, that the prospect of the spread of manuring for the paddy crop in the Assam Valley is not particularly brilliant. The returns from phosphatic manuring are spread over three years or more, and in some cases the return in the first year will not cover the cost of the manure. The cultivator cannot afford to wait for his profit and so is inclined to regard manurial demonstrations with suspicion. In the case of green manure, which is inexpensive and gives quicker returns, there is more hope, but the chief obstacle to the spread of this practice is the unenclosed land system, which allows stray cattle to roam about and destroy the young green manure crops unless they are specially protected. In future manurial demonstrations with rice must be confined strictly to worn out land on which the crop has fallen seriously below the average. In these cases, where it is a choice between practically no crop at all without manure and a crop with manure, there is some chance of doing good.

Demonstrations with Mr. Hector's selected variety *Indra sail* and Srijut Narayan Barua's *George sail* were undertaken in Sibsagar, Kamrup and Nowgong in altogether 36 centres. *Indra sail* gave an average increase over the local varieties of 272 lbs. per acre in Sibsagar, 158 lbs. in Kamrup, and 176 lbs. in Nowgong, while *George sail* gave average increases of 237 lbs. and 96 lbs. in Sibsagar and Kamrup, respectively. In order to introduce these varieties more widely arrangements are being made by the seed depôt to distribute 40 maunds of *Indra sail* and a few maunds of *George sail* in five-seer bags this year.

In the Surma Valley paddy manurial demonstrations continue to give uncertain and unsatisfactory results in the first year of application. Bonemeal, either used alone or in conjunction with dhaincha green manure or oilcake, has given fairly profitable results on the poorer lands, when the increased crop over a two or three year period is taken into consideration. An expenditure on bonemeal of Rs. 9 per acre has given an increased crop in the two years worth Rs. 19-5, bonemeal and dhaincha costing Rs. 10-12 have together given an increase worth Rs. 24-11 in two years, an application of bonemeal and oilcake costing Rs. 10-8 gave an increased crop worth Rs. 20-12—a satisfactory return of over 100 per cent in each case. Demonstrations with dhaincha alone have usually proved satisfactory where it is possible to protect the green crop from cattle, but as in the Assam Valley, owing to the small area of land owned by the individual cultivator in one place and the difficulty of fencing the green cropped area, this system of manuring is making little headway.

The effect of manuring the paddy crop in the hills is much greater than in the plains. In the Khasi and Jaintia Hills the increase obtained in the first year was sufficient to leave a small profit of Rs. 8-9-6 per acre, while the increased crops obtained from plots laid down two years ago was of an average value of Rs. 35 per acre. The demonstrations arranged three years ago gave a small average profit of Rs. 7-5 only, but these results are much below the normal.

Potatoes.

24. Successful demonstrations with superior varieties were made in Kamrup, Sibsagar and Nowgong districts. The average increase in favour of the Shillong varieties over the *deshi* varieties was 2,426 lbs. per acre in Sibsagar, 2,394 lbs. in Nowgong and 2,225 lbs. in Kamrup.

Demonstrations to prove to the cultivators that the use of larger seed is advantageous were carried out with much success. Medium sized setts weighing 30 to 40 to the seer were tried against small setts weighing 70 to 80 to the seer. In every case the larger setts gave an increased outturn over that of the small setts, amounting in Kamrup to 4,333 lbs. per acre, in Sibsagar to 2,346lbs. and in Nowgong to 2,032 lb. Demonstrations were carried out in Sylhet and Cachar to compare Shillong seed with the local seed. The superiority of the Shillong varieties were not so marked as usual owing to the very dry cold weather, which was unsuitable for most *rabi* crops. Demonstrations were conducted in the North Cachar Hills and parts of the Khasi and Jaintia Hills where the potato cultivation has not yet become popular; the results were fairly satisfactory. Depôts for the sale of seed potatoes were opened in the latter district and 7·27 tons of seeds were sold to the cultivators : a further quantity of 5 5 tons was distributed free to cultivators who undertook to grow the seed,

keep it pure and return to the department one and a half maunds for each maund of seed supplied. In the Naga Hills potatoes were cultivated and the outturn was good in Mokokchang subdivision, where the crop is slowly growing in popularity.

Sugarcane.

25. Demonstrations with the superior varieties, Striped Mauritius, B-376 and B-147, from Jorhat were continued successfully in Sibsagar, Kamrup and Sylhet, the average outturn of *gur* from plant cane being over 45 per cent. and that of ratoon cane over 67 per cent. more than that of the local varieties grown on similar and adjacent plots. These varieties are now well known in several districts with the result that we are unable to deal with all the demands for setts. This year over 3½ lakhs of setts were distributed, principally from the Kamrup and Jorhat farms. Green manuring as a preparation for sugarcane was demonstrated in Sibsagar with cowpeas and in Kamrup with dhaincha. The average increase of *gur* per acre due to green manuring was 992 lbs. value about Rs. 60, in Sibsagar, and 1,913 lbs. value Rs. 116, in Kamrup. It would appear from this that, in the words of the Deputy Director, goldmining will have to look to its laurels as a profitable occupation, as the actual cost of green manuring in cash to the cultivator is only about Rs. 2 to Rs. 4-8 per acre for seed, to which must be added his own labour; but here again protection is required against cattle if the custom is to become popular.

The three roller iron sugarcane mills, which have now been demonstrated for some years, continued to be appreciated by the cultivators, and in spite of the price, which was increased to Rs. 80, in the Assam Valley, 38 mills were sold during the year, mainly in Kamrup and Nowgong and four mills in the Surma Valley.

Jute.

26. Mr. Finlow's variety *Kakaya Bombai* was demonstrated against local varieties in Nowgong, Kamrup and Sylhet. In Kamrup it gave an average increase in fibre of 252 lbs. per acre, in Nowgong 105 lbs. and in Sylhet 567 lbs. per acre over the local varieties. In Sylhet manurial experiments with bonemeal and Hyacinth ash were also carried out on this crop with an extra yield of fibre to the value of Rs. 20 for an expenditure of Rs. 10 per acre. There is now a growing demand for this improved variety in both valleys and arrangements are being made to provide a large supply of seed for next year.

Water Hyacinth.

27. This pest continues to spread in the low-lying tracts of the Surma Valley, where it appears to have established itself four or five years ago. It may have arrived there earlier, but does not appear to have been definitely recognized until about the time mentioned.

With a view to checking the spread of the weed exprimental work was started in the previous year and continued in the last, the object being primarily to destroy the weed and, at the same time, to find out something of the value of the ash as manure and to gain information as to the probable cost of the work of eradication. In the cold weather of 1917-18 a small quantity of ash was prepared, which on analyses showed from 9% to 12% of potash. Part of this ash was sent to tea planters and was applied by them to green manure crops grown among tea. Another portion was used for experimental manuring of jute, and the remainder was sent to a Calcutta merchant. The material gave good results on green manure crops and on jute, but the Calcutta firm reported that they could not utilize this low grade material in their preparations. As this ash contained potash almost equal in quantity to kainit, one of the German potash manures which had an extensive sale in European countries in pre-war times, it was thought that something might be done towards utilizing the ash on a considerable scale within the province, and accordingly the work was continued in the past cold weather 1918-1919. A total quantity of 25 tons of ash was prepared. Somewhat less than one-third of this was produced under the direct supervision of our agricultural officers and the balance by two landowners of Chatian in the Habiganj subdivision. Arrangements were entered into with several tea planters in both valleys to purchase the material at a price based on the potash content as shown by analysis. The Traffic Manager of the Assam-Bengal Railway was approached and was good enough to give specially low freight rates for its transport. Samples were taken by a responsible agricultural officer as the material was filled in the railway wagons, and these samples were analysed by the Agricultural Chemist. The figures supplied by him have been found so low, 3¾ per cent. to 6 per cent. of potash, as to preclude any possibility of local landowners or cultivators finding the preparation and supply of the ash a profitable business, unless indirectly as part of a scheme for clearing the lands and water courses of the district. From the planters' point of view also it will be

unprofitable to purchase and pay handling and freight charge on such low grade material. The average cost of preparing the ash under departmental supervision, where all labour had to be paid at current rates, was Re. 1-9 per maund, while, when done by the landowners or rather by their cultivators, the cost is reported to have been about twelve annas per maund. In the latter case much of the work of collecting the weeds was done free by the cultivators when preparing their lands for ploughing, while in the former the weeds were removed from tanks and water courses, often to a considerable distance, and dried and burned by paid labour. The average cost of preparing and delivering to the purchasers this total quantity of 25 tons handed was Rs. 44-4 per ton while the average price realized will amount to only Rs. 29 per ton.

Inquiries were made on the spot regarding the methods adopted by the Bengal department to prepare a concentrated potash salt from the ash of the water hyacinth weed, and it was found that the financial return was only about half of the expenditure in an urban area and one-third in a rural area. From the foregoing it will be seen that even under the most favourable conditions of marketing and transport, it will not be possible either to produce an ash of commercial value or to prepare a concentrated salt without spending considerably more than the value of the produce, and that if eradication is ever to be attempted, it must be on other than a direct profit paying basis. In the infested tracts large quantities of the weed are used for fuel during flood times: when fodder is scarce or non-existent green weeds are used, one can hardly say for fodder, but for keeping the cattle alive. Weeds which have to be removed from low-lying lands to permit of cultivation are generally burned and the ash used as a manure. As a result of departmental interest in the question the use of the ash or of the rotted plants as manure is spreading widely in the infested tracts with the result that the spread of the weeds is being checked to some extent.

Terrace cultivation.

28. In the Sadiya frontier tract two Angami Nagas are employed in giving instruction to the Abors. In the vicinity of Pasighat it is reported that on 3½ acres of terraces a total crop of over 4 tons of paddy was obtained, while at Rotung, where 12½ acres have been terraced, the outturn of paddy from this area was about 18 tons, or at the exceptionally high rate of 1½ ton per acre. In the Naga Hills terrace cultivation was introduced in several villages where it had not previously been tried, a large number of existing fields were enlarged by the addition of fresh terraces and the crop reaped during the year was normal. In the Lushai Hills the number of terraces decreased owing to the absence of many cultivators in France and on coolie columns, but the yield increased. An experiment with a summer rice variety from Cachar has been started in plots on which water-supply cannot be maintained early and late in the year.

Minor demonstrations.

29. *Fruit.*—The Fruit Inspector was relieved for work in connection with his appointment at the close of the year and hence there is very little of his work to record. He supplied as usual grafts and seedlings of various kinds, which included coffee seedlings 1,100, pine-apple suckers 1,800 and pear grafts 43. It is proposed to establish a few small orchards of non-tropical fruits at selected centres in the higher parts of the Khasi Hills and five sites have been selected for the purpose. Grafting and budding demonstrations in the Khasi Hills were continued with success.

At Sadiya a start has been made with lichi, guava, peach, orange, lime and pomelo trees with the object of distributing grafts in the future. At present the trees are young, but are reported to be flourishing. In the Naga Hills the orchards at the various road stages are reported to have been doing well: in the garden at Tessima guavas, almonds and Japanese oranges did well and the apple and pear trees have made good growth.

Fodder crops.—Cowpeas alone and cowpeas and maize mixed were grown successfully at 3 centres in Kamrup, but it is reported that cultivators as a rule take absolutely no interest in our attempts to introduce fodder crops. In the Surma Valley *jowar* was a failure, but cowpeas did well in a few high land situations and was much appreciated as a green fodder.

Miscellaneous crops.—An attempt to introduce *rabi* crops including wheat, barley and a variety of pulses was made in both valleys with indifferent success. The season was exceptionally dry and the cultivators took very little interest in the crops. The results of Assam mustard were very encouraging in the Surma Valley.

At Sadiya the produce of 2 acres of English vegetables was sold locally for Rs. 825, Shillong potatoes proved about three times as prolific as the local variety; half an acre of groundnuts gave a yield of about 1 ton per acre; 2 acres of *aus* paddy more than a ton per acre; ¼ acre wheat 823 lbs. per acre, and ¼ acre oats 1,646 lbs. per acre. Three Jorhat varieties of sugarcane also did well.

In the Garo Hills attempts to grow Khasi varieties of paddy failed, but Garo varieties gave an average outturn of nearly 1 ton per acre for *jhum* paddy and more than 1 ton per acre of wet paddy. In the same tract potato demonstrations at 9 centres yielded 2 tons per acre on the average. Groundnuts also were tried, but the yield was poor.

Improved implements.—Demonstrations of Meston ploughs were continued in both valleys. The present high price prevents them from becoming popular with the cultivator.

Conservation of cattle manure.—During the year 143 demonstrations on the storing of cowdung in covered pits and sheds were made in Sibsagar, Kamrup, Nowgong and Lakhimpur and 28 in Sylhet.

Demonstrations by Honorary Correspondents.

30. At the close of the year there were 31 Honorary Correspondents against 34 in the previous year. A list of these correspondents is appended to this report. There were two new appointments at the end of the year and the names of five correspondents were struck off the list during the year.

Mr. Ferguson of Dhamai had a successful crop of *Kakaya Bombai* jute from which he saved the seed for distribution amongst the neighbouring cultivators. He also experimented with water hyacinth ash as a manure. Babu Joynath Nandi of Bejura gave assistance in the preparation of hyacinth ash and encouraged the growth of Shillong potatoes amongst his cultivators and neighbours. Maulvi Tayab Ali of Sonapur rendered much assistance to the department by growing *Indra sail* paddy and *Kakaya Bombai* jute for seed. He supplied 8 maunds of jute seed to the Seed Depôt, Gauhati. Srijut Pithambar Saikia of Kowang, Lakhimpur, is reported to have grown Garo cotton successfully on a large scale, and Maulvi Zubaid Ali Hazarika of North Lakhimpur made an experiment with Shillong varieties of potatoes.

Now that the department is developing the distribution of improved varieties of seed, there is an increasing scope for these gentlemen to assist us in undertaking to grow pure lines of seed. This, I think, would be the most useful form of assistance that they could give us in future.

CHAPTER V.

SUPPLY OF SEEDS, MANURES AND IMPLEMENTS.

General.

31. At the close of the year under report we had two depôts at Gauhati and Sylhet in charge of the Superintendents for the supply of pure seeds and manures and approved implements to the public. The Local Administration has approved the rules of business for the working of these depôts and they have been brought into operation from April of this year. Since the introduction of the system of crediting sale-proceeds against the expenditure the work at Gauhati has largely expanded. The depôt at Sylhet was started from October 1918 and time was mainly devoted to its proper organization. A good start has however been made in the six months during which business has been carried on. The depôt is located in a hired house adjoining the Sylhet ghat railway station. The Chief Commissioner paid a visit to it in November last.

With the increasing demand for seeds the question of the establishment of a seed-growing farm for the province demands attention. With the exception of the more valuable European vegetable seeds practically all the seeds now stocked in the depôts for supply might be grown locally. At present we purchase the seeds without much knowledge of their quality. We attempt comparative tests on the lands of cultivators, but with a seed farm of our own we could compare, test, select and acclimatize before distributing the seeds to the grower. There has been a long standing suggestion to open an experiment station for Lower Assam, and if we keep on the Kamrup farm, both might be used to some extent for this purpose by reserving the necessary area for seed growing.

Gauhati Seed Depôt.

32. During the nine months of the year the Gauhati Seed Depôt issued 36 tons of seeds and manures and 78 implements, of which 27 tons of seeds, 3 kinds of manures and 62 implements were actually sold to the public; the remainder was distributed free to the Honorary Correspond-

ents and supplied for demonstration work and to the farms of the department. The bulk of the supply was in Shillong potatoes, of which 24 tons were supplied. Other seeds included 873 lbs. of jute, about 1 ton of oats and varieties of rice and other crops. A promising new line of work at Gauhati was the distribution of two-anna packet of Suttons' vegetable seeds. Amongst the implements, 38 sugarcane mills were supplied. In addition to the seeds, 3,68,000 sugarcane setts of the superior varieties were distributed by the district staff : the bulk of these setts were brought from the Kamrup Farm. The total liabilities of the depôt for the nine months under review was Rs. 9,426, of which Rs. 7,831 was incurred on account of the purchase of seeds, manures and implements, Rs. 300 for the stores supplied free from farms, etc., and the remainder on account of establishment, rent, and contingencies including packing and freight charges. The total receipts were Rs. 8,959, of which Rs. 6,739 were actually realized and credited into the treasury, including Rs. 250 for the previous year, and Rs. 509 were outstanding. Under the new rules there should be no credit sales and the Deputy Director's attention has been drawn to this. The value of seeds, etc., supplied free to Honorary Correspondents and for experimental and demonstration purposes amounted to Rs. 1,961. The nett cost or loss of the working of the depôt, allowing for depreciation and increase of stock, was Rs. 467 during the year.

Sylhet Seed Depôt.

33. In Sylhet in the six months of the year under report seeds, manures and implements to the value of Rs. 5,500 were dealt with. The most important of those supplied were 7 tons of Shillong potatoes, about 3 tons of pulse and other oilseeds, about 1 ton paddy, 1,107 lbs. of jute, 21 tons of bonemeal sold in the Khasi and Jaintia Hills and 7 sugarcane mills. Out of the total quantity of Shillong potatoes supplied, about half were sold to the public and the balance were supplied at concession rates to Honorary Correspondents and for demonstration purposes. The circular on the cultivation of pulse crops issued by the Department towards the end of the rains of 1918 created considerable interest in the Surma Valley with the result that there was a demand for seeds from every part. More than fifty-three tons of bonemeal were supplied through the seed depôt for distribution in the Khasi and Jaintia Hills and almost the entire quantity has been disposed of since the close of the year.

The total charges for the depôt for six months of the year under report was Rs. 7,567, of which Rs. 5,241 was incurred on account of the purchase of seeds, manures and implements, Rs. 595 for the stores supplied free from farms, etc., Rs. 1,299 for furniture and the remainder on account of establishment, rent and contingencies including packing and freight charges. The total receipts were Rs. 5,372, of which Rs. 3,566 were actually realized and credited into the treasury and Rs. 260 were outstanding. The value of seeds, etc., supplied free to Honorary Correspondents and for experimental and demonstration purposes amounted to Rs. 1,446. Allowing for depreciation and increase in stock, the nett cost of the working of the depôt was Rs. 2,195 of which the capital expenditure on account of furniture amounted to Rs. 1,299.

CHAPTER VI.

CATTLE BREEDING.

34. The Upper Shillong herd of Patna and cross-bred cattle is still maintained and numbered 110 at the close of the year against 100 in the preceding year. Two Patna bulls were obtained during the year from Sonepur in Bihar for breeding purposes. Breeding will be confined for the present to this Patna herd only. Six breeding bulls and fifteen rejected cattle of various ages and conditions were sold to the public. The present herd is still too large for the amount of grazing and the supply of fodder available on the farm and steps will be taken to reduce the number as far as possible. The cost of maintenance of the herd was Rs. 4,903 for the nine months of the year under report against Rs. 3,015 in the previous year, while the income from milk amounted to Rs. 1,408 against Rs. 2,101, and the value of cattle Rs. 753 against Rs. 226, so the nett cost was Rs. 2,742 against Rs. 1,688. The increase was mainly due to the larger number of cattle and the rise in the price of food.

With regard to the question of improvement in the existing breeds of cattle in Assam the Chief Commissioner issued a resolution during the year directing that measures should be taken for (i) the importation of selected sires which will be entrusted either to local bodies or to tea planters and other individuals interested in cattle breeding and the improvement of the milk supply, (ii) the gradual education of the people by example and precept to understand the benefits of selective breeding and of proper feeding and keeping of cattle, (iii) the reservation of adequate grazing grounds, and (iv) the introduction of suitable fodder crops and the devising

of means for preserving grass and other fodder in the conditions in which the people live. The Chief Commissioner proposed to constitute local committees of persons interested in cattle breeding with a view to supervising the working of the experiments outlined above and in educating the people. Having consulted the two Commissioners I have suggested the constitution of the local committees indicated from the Local Boards.

CHAPTER VII.

MISCELLANEOUS.

General progress.

35. The difficulty of our shortness of superior staff mentioned in the last year's report has been intensified since the close of the year by the resignation of Mr. McKay and by the illness of Mr. Birt as the result of military service. I hope that Mr. McKay will eventually be replaced by a member of the Indian Agricultural Service, but the latter will start as a stranger and must take some time to learn local conditions. The two circles will be for some time in charge of the two Superintendents acting as Deputy Directors, whose promotion should be an encouragement to them and to their fellow officers. I am still of opinion that we should have at least four Deputy Directors, so that even with a substitute for Mr. McKay, we shall require officers for two more circles. With the end of the war we have been able to re-open schemes which were outlined in 1914 and I hope that we shall soon be given a Botanist of our own and that the laboratory building at Jorhat will be enlarged for his accommodation and that of the Entomologist. Jorhat should then become a central research station like Dacca: but we shall want an area for rice cultivation there to make it complete.

As previously noted, we are in urgent need of assistance from private well-to-do people in providing land for the growth of good seeds for their localities. Gentlemen of standing willing to give us this help will be welcomed as Honorary Correspondents. Those on our list now have given us very considerable help and we are grateful to them for it.

With regard to cattle breeding, I often wonder whether there is a real demand from the cultivator for any improvement and whether such claims as are made do not come from townspeople who wish to obtain a cheaper supply of milk than they can count on in present conditions. Unless the cultivator wishes to improve his cattle, no efforts from above will make him to do so. I hope that the local committees to be appointed will help in solving this question.

On the whole I think that we continue to make fair progress, but it must be slow. The result of manurial trials show how timid the cultivator's want of capital makes him. The success of the seed depots shows that he is keen on good seed, while the continued sale of sugarcane mills shows that his original timidity disappears in time if he is really convinced of inevitably good results. With regard to steam tackle cultivation, we have at least succeeded in procuring the formation of the Assam Sugar Estate and Factories, Limited, to replace the original cane contractor at Kamrup, while a leading Calcutta firm has obtained a neighbouring tract of land for the same purpose. This shows at least that there is distinct promise in our experiment.

Notice of Services.

36. Mr. Meggitt has at last been able to start work in a proper laboratory and should be able to give more attention to his legitimate duties with profitable results to the public. Mr. Birt has had to take leave after four months' resumption of his civil duties: he has been almost four years on military service and found it difficult to appreciate the condition of our work on his return: it is regrettable that he has again to leave us. In Mr. McKay we have lost a sound, keen and energetic officer, whom we were unable to retain even by considerably improving his position. Mr. Chaston continues to give satisfaction in his difficult and jungly charge in the Kamrup Farm. Mr. Holder has given his usual care and attention to the fruit station at Shillong. The good work of Srijut Lakheswar Barthakur has earned for him the acting appointment of Deputy Director in the Assam Valley. Maulvi Fazlul Huq, Superintendent in the Surma Valley, has done good and useful work and promises to be a reliable officer. The Farm Managers at Jorhat and Karimganj, Srijut Binaram Das and Babu Surendra Nath Gupta, continue to do well. Of the Inspectors, Babu Satyendra Chandra Dutta as usual was efficient and will act as Superintendent in the Assam Valley. Babu Satya Ranjan Gupta, Entomological Assistant, was satisfactory and should do better in his new headquarters. My Head Assistant, Babu Dinesh Chandra Das, continues to be most helpful.

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

APPENDIX I.

List of Honorary Correspondents of the Department of Agriculture in Assam.

SYLHET.

1. D. Ferguson, Esq., Dhamai Tea Estate, Post Office, Dhakinbag.
2. Babu Girja Nath Biswas, Post Office Baniachang.
3. „ Pavitra Nath Das, Post Office Beani Bazar.
4. „ Bidya Kumar Chawdhuri, Sunamganj.
5. Maulvi Abdur Rahim Chowdhury, Zamindar, village Sultanpur, Post Office Jalalpur, Sylhet.
6. James Laurie, Esq., Post Office, Nariancherra, Akbarpur, Queen Pine Apple Estate, South Sylhet.
7. Babu Joynath Nandi Mazumdar, Post Office Bajura, Habiganj.

CACHAR.

8. Babu Sarada Charan Chakravarty, B.A., Assistant Inspector of Schools, Silchar.
9. „ Bharat Chandra Das Chowdhury, Salchapra, Cachar.

KHASI AND JAINTIA HILLS.

10. U. Job Solomon, Shillong.
11. U. Kubur Singh, Mylliem.
12. U. Bordhon Roy Kanti, Mahadev, Cherrapunjee.
13. U. MacDonald Gatphoh, Jowai.

GOALPARA.

14. Babu Dijesh Chandra Chakravarti, Manager, Gauripore Estate.
15. „ Lalit Mohan Datta, Dhubri.

KAMRUP.

16. E. P. R. Gilman, Esq., Barduar Tea Estate, Post Office, Palasbari, Kamrup.
17. Munshi Kaymubir Rahman, Gauhati.
18. „ Tayab Ali, Sonapur, Kamrup.
19. Srijut Pratab Narain Chowdhury, Mauzadar, Khata, Nalbari.
20. „ Chandra Nath Sarma, Pandit, Post Office, Palasbari.

NOWGONG.

21. Babu Jnan Chandra Ray, Baithulongso, Post Office, Kampur.
22. Srijut Bhagadatta Hazarika, Mauzadar, Dharamtul Post Office.

SIBSAGAR.

23. Srijut Deveswar Sarma Barthakur, Thakurbari Farm, Post Office, Haloguri.
24. „ Deveswar Gossain, Barpathar Sugarcane Farm, Post Office Badlipur (Golaghat).
25. „ Narayan Chandra Barua, Nakachari, Lahing, Jorhat.

LAKHIMPUR.

26. Srijut Pithambar Saikia, Mauzadar, Khowang, Post Office Khowang.
27. „ Baikuntha Narayan Barua, Panitola Post Office.
28. Maulvi Zubaidali Hazarika, North Lakhimpur.

NAGA HILLS.

29. Dr. J. Riley Bailey, Mokokchang.

GARO HILLS.

30. Babu Bishnu Charan Datta, Superintendent, Deputy Commissioner's Office, Tura.

RANCHI.

31. Rai Bhupal Chandra Basu Bahadur, B.A., M.R.A.C., M.R.A.S.

APPENDIX II.

Statement showing the receipts and expenditure of the Department of Agriculture for the yea ending the 31st March 1919.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
(*a*) Sale of manure and farm produce,..	9,409 14 0	(1) Superintendence	54,637 2 3
(*b*) Potatoes	528 4 6	(2) Agricultural instruction ...	5,242 2 2
(*c*) Other receipts	1,801 8 6	(3) Agricultural Chemist ...	14,929 3 5
(*d*) Receipts from Seed Depôt ...	10,596 13 6	(4) Experiment Stations	1,41,843 9 7
		(5) Agricultural Demonstrations and Experiments.	9,631 9 6
		(6) Public Exhibition and Fairs ...	200 0 0
		(7) Seed depôts	18,814 11 6
Total receipts	22,336 8 6	Total expenditure ...	2,45,298 6 5

APPENDIX III.

Glossary.

Kheri Magh	Local variety of sugarcane.
Aus	Autumn rice.
Sail or Sali	Transplanted winter rice.
Dhaincha	Sesbania Aculeata.
Raishan	Paspalum Sanguinak.
Boro	Spring rice.
Cowpea	Vigna Catiang.
Khesari	Lathyrus sativus.

Resolution on the Agricultural Department Report of Assam for 1918-19.

Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 2401R., dated Shillong, the 1st August 1919.

READ—

The Report of the Department of Agriculture, Assam, for the year ending the 31st March 1919.

RESOLUTION.

THE period covered by the annual report of the Department has been altered from the year ending the 30th June to that ending the 31st of March; consequently the present report is for a period of nine months only. The object of the change is to allow each report to cover one complete cycle of agricultural operations. Practically all the important crops mature in the autumn or winter, and sowings for the next harvest begin in the spring so that the 30th of June fell in the middle of the cultivating season.

2. The staff of the Department underwent several changes in the period under review. Mr. Meggitt, Agricultural Chemist, acted as Deputy Director of Agriculture, Assam Valley, in addition to his own duties till the end of August 1918, when Mr. McKay took over the control of the Seed Depôt at Gauhati and demonstration work in the Assam Valley in addition to his own work as Deputy Director of Agriculture, Surma Valley, leaving the Jorhat and Kamrup farms under Mr. Meggitt. Mr. Birt returned from military duty after nearly four years' absence, but unfortunately has been compelled by bad health to take leave. Four additional Agricultural Inspectors were appointed bringing the total number up to 11. Twenty-five demonstrators were employed during the year. The need for the appointment of an Economic Botanist and more Deputy Directors of Agriculture has again been noticed by the Director of Agriculture and the Chief Commissioner does not question it. The Department has suffered much loss by the permanent departure of Mr. McKay and the temporary departure of Mr. Birt. The absence of these officers has however given an opportunity to the Chief Commissioner to employ two qualified Indians as Deputy Directors. The Chief Commissioner has gladly availed himself of this opportunity.

3. The Director of Agriculture represented that the number of students at Sabour and under training on the farms was sufficient for the requirements of the Department for some years, and that he had no expectation of being able to obtain private employment for passed students not taken into Government service. For the next three years the number of candidates to be nominated annually for scholarships tenable at the Sabour Agricultural College has, therefore, been limited to two per annum on the understanding that the Director of Agriculture is to select one candidate only unless there are special reasons to the contrary and that preference is to be given to Muhammadans. It is clear that the award of more than one scholarship annually cannot be justified without a definite assurance from private employers that they will give appointments to passed candidates who do not enter Government service.

4. The experiment in growing sugarcane on a large scale for the manufacture of white sugar was continued. The season was unfavourable for sugarcane, the rainfall being badly distributed, and the ratoons were poor owing to the delay in cutting the cane in the previous year. The crop amounted to something over 5,000 tons, of which, owing to defects in the machinery, the mills took not much more than a third. As no buyers were forthcoming and as (owing to the inaccessibility of the farm) no one would take away the cane even as a gift, large quantities were cut and left to rot upon the farm. This was a lamentable loss, especially in view of the shortness of sugar in the Empire, but as the mills had been unable owing to the war to set up the necessary machinery, the Chief Commissioner cannot attribute blame to any one

In any case it was decided to go on harvesting the plant cane, whether it could be used or not, in order to give the young ratoons a chance. Since the close of the year the plants and ratoons have been attacked by beetles. The origin of, and means of extirpating, this pest are being examined and will be dealt with in the next report. The mill-owner has transferred his interests in the plantation to a company called the Assam Sugar Estates and Factories, and a leading Calcutta Firm has obtained settlement of a neighbouring tract of land for the cultivation of sugarcane. This shows that the experiment is not without promise, and the Chief Commissioner hopes that, in spite of the set backs and disappointments during past years, the inception of the experiment will be more than justified.

At the Jorhat Farm varieties of sugarcane are grown and tested under varying conditions. The experiments demonstrated the superiority of the selected over the local varieties of cane and the value of green manuring and of the application of phosphates. During the year 3½ lakhs of setts of the better kinds of cane chiefly from the Kamrup and Jorhat Farms were distributed to cultivators. Rice selection work was continued at the Karimganj Farm, and the acclimatizing, testing, and distribution of potatoes at the Upper Shillong Farm. There was a great demand, both from the hills and plains districts, for seed potatoes from the Shillong Farm.

5. The Chief Commissioner has read with much interest the account of the work of the Entomological Assistant, Babu Satya Ranjan Gupta, in connection with the insect pests which attack paddy and other crops. The question of the control of insect pests requires the most careful attention and it is to be hoped that with the gradual establishment of a staff of demonstrators under the charge of an Inspector in each district the cultivators' interest in this work will be aroused.

6. The demonstration work done during the year was directed mainly to showing the superiority of the selected varieties of rice, sugarcane, jute and potatoes, and the advantage to be gained by the use of manure and good seed. The demonstrations undertaken in the past few years have proved that phosphate in some form will give profitable results as a manure for paddy, and also that the crop can be improved considerably at a small cost by green manuring. But returns from phosphatic manuring are not immediately apparent, and the cultivator is, therefore, inclined to regard it as unprofitable. The Director holds that in future manurial demonstration with rice should be confined to land so exhausted that the yield obtainable from it without manure is well below the average. On such land the benefit of manuring is most evident, and if the cultivator can be induced to use manure on his poorest land, he may in time come to use it elsewhere.

7. The measures taken to check the spread of water hyacinth were continued on a larger scale. Large quantities of the weed were collected and burnt, and some 25 tons of ash were prepared. Arrangements were made for the sale of the ash at rates which would have been remunerative had the potash content been equal to that found in the small scale experiments made in 1917-1918. On analysis, however, the percentage of potash in the ash was found to range only from 3¾ to 6, and ash of this poor quality has little commercial value. The preparation of a more concentrated salt from the ash is a simple process but involves some labour, and the financial return is not equal to the cost of preparation by the methods so far known. The Chief Commissioner, however, does not intend to desist from the efforts to combat the spread of water hyacinth merely because the salt prepared by the cultivators cannot compete, without help from Government, against salt prepared in large factories in Europe. The Chief Commissioner is considering whether by means of a subsidy he can enable the villagers to put pure potash salt upon the market at profitable terms. Meanwhile it is well worth the villager's while to spend some of his own labour on clearing his tanks and his water-ways of this pestilent obstruction, and he may use the ash to fertilise his own fields and sell his surplus production to his less enterprising neighbours. In any case it is a hopeful sign that the use of the ash or of the rotted plants for manure is spreading. This is attributed to the example and demonstrations of the Agricultural officers. The Chief Commissioner has made a grant of Rs. 10,000 for continuing the campaign in the current year.

8. A seed depôt was opened at Sylhet in October 1918 and the rules of business for the working in this depôt and that at Gauhati were approved and brought into operation during the year. The introduction of the system of crediting sale proceeds against expenditure has resulted in a large increase in the sales of the Gauhati depôt. A depôt was opened also in Shillong for the sale of seed potatoes, and over 12 tons were sold for cash or on promise of repayment in kind. The Director of Agriculture has drawn attention to the need for the establishment of a seed-growing farm for the

province and has mentioned the suggestion that an experimental station should be opened for Lower Assam which might be used to some extent for the purpose of growing seeds. The Chief Commissioner awaits his proposals on the subject.

9. The policy of the Local Administration on the subject of improving the existing breeds of cattle in Assam was defined in the Resolution on the subject which was issued in October 1918. It was stated therein that the Chief Commissioner proposed to rely on the following measures :—

(1) The importation of selected sires, which will be entrusted either to local bodies or to tea planters and other individuals interested in cattle-breeding and the improvement of the milk supply.

(2) The gradual education of the people by example and precept to understand the benefits of selective breeding and of proper feeding and keeping of cattle.

(3) The reservation of adequate grazing grounds.

(4) The introduction of suitable fodder crops and the devising of means for preserving grass and other fodder in the conditions in which the people live.

In pursuance of the first of these measures the Government of Bengal kindly promised to supply this Administration with a few bulls from the Rangpur Farm, and intimation has been received that arrangements are being made for the despatch of a few selected yearlings. Progress necessarily must be slow and we have still much to learn as to the wants of the cultivator, but the Chief Commissioner has invited the co-operation of Local Boards and hopes that they will afford material help in solving the difficulties of the subject.

10. One of the most useful pieces of work which is being carried on by the Department is the Fruit Farm at Shillong. Owing to the patience, hard work and enthusiasm of the Hon'ble Mr. Holder the experiment of growing apples in the hill districts of Assam is now a complete success. The inhabitants of the Khasi Hills are already taking grafts in order to open out orchards, and the Chief Commissioner looks forward to the spread of apple farming as a profitable industry among all the hill tribes of the province.

11. The Chief Commissioner has read with pleasure of the assistance which has been rendered to the Department by the Honorary Correspondents in the matter of the preparation of hyacinth ash, the growth of potatoes and the distribution of improved varieties of seed. He is pleased to acknowledge the energy and ability displayed by Mr. McSwiney in the administration of the Department and the good work of the officers whom the Director has mentioned. The success which has attended the efforts of the Depart ment during the year under report is all the more creditable in view of the fact that it has for the greater part of time been considerably understaffed.

ORDERED that a copy of this Resolution and of the Report be published in the *Assam Gazette* for general information.

By order of the Chief Commissioner of Assam,

J. E. WEBSTER,

Chief Secretary to the Chief Commissioner of Assam

A. S. P. O. (R. & A.) No. 18—400—5-2-1919—A. U. A. & O. M. Roy.

2

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending 31st March 1920

BY

J. McSWINEY, Esq., I.C.S.,
DIRECTOR OF LAND RECORDS AND AGRICULTURE, ASSAM.

SHILLONG:
PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1920.

Price 1s.] [*Price* 8 *annas*

Agents for the sale of Books published by the Assam Administration.

Agents in India.

(1) Messrs. Thacker, Spink & Co., Calcutta.

(2) Messrs. W. Newman & Co., Calcutta.

(3) Messrs. S. K. Lahiri & Co., Calcutta.

(4) Messrs. A. M. and J. Ferguson, Ceylon.

(5) Messrs. R. Cambray & Co., 6 and 8/2, Hastings Street Calcutta.

(6) Messrs. Thompson & Co., Madras.

(7) Babu Hari Ram Dhar, B.A., Popular Library, Dacca.

(8) Messrs. D. B. Taraporevala Sons & Co., 103 Meadon StreetFort, Post Box No. 187. Bombay.

(9) The Indian School Supply Depôt, 309, Bow Bazar Street, Calcutta.

(10) Messrs. Rai M. C. Sarkar Bahadur & Sons, 9-2 \, Harison Road, Calcutta.

(11) Messrs. Students & Co., Cooch Bihar.

(12) Messrs. Vas & Co., Madras.

(13) The Standard Literature Co. Limited, 23-1, Old Court. House Street, Calcutta,

(14) The Standard Book Stall, Karachi.

(15) Mr. Mangaldas Harkisandas, Surat.

16) Messrs. Rarsandas, Narandas & Sons of Surat.

(17) Munshi Seeta Ram, Managing Proprietor, Indian Army Book Depôt Juhi, Cownpore.

(18) Proprietor, New Kitabkhana, Poona.

(19) The Association Press, Calcutta.

Agents in England.

(1) Messrs. Constable & Co., 10, Orange Street, Leicester Square, W. C.

(2) Messrs. Kegan Paul, Trench, Trübner & Co., 68—74, Carter Lane, E. C., London, Oriental Department, 25, Museum Street, London W. C.

(3) Mr. B. Quaritch, 11, Grafton Street, New Bond Street, W.

(4) Messrs. P. S. King & Son, 9, Bridge Street, Westminster, S. W., London.

(5) Mr B .H. Blackwell, 50 and 51, Broad Street, Oxford.

(6) Messrs. Deighton Bell & Co., Limited, Cambridge.

(7) Messrs. Henry S. King & Co., 65, Cornhill, E. C., London.

(8) Messrs. Gumulay & Co., 54, Parliament Street, S. W. London.

(9) Messrs. W. Thacker & Co., 2, Creed Lane, London, E. C.

(10) Messrs. Luzac & Co., 46, Great Russell Street, London, W. C.

(11) Mr. J. Fisher Unwin, Limited 1 Adelphie Terrace, London, W. C.

(12) Messrs. William Wesley & Son, 28, Essex Street, Strand, London.

Agents on the Continent of Europe.

(1) M. Ernest Leroux, 28, Rue Bonaparte, Paris.

(2) Martinus Nijhoff, The Hague.

(5) Messrs. Oliver and Boyd, Tweedale Court, Edinburgh.

(4) Messrs. E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

SHILLONG:

PRINTED BY D. C. NANDI, OFFG. SUPERINTENDENT, ASSAM SECRETARIAT PRESS.

No. IXA-1—316.

FROM

J. McSWINEY, Esq., I. C. S.,
DIRECTOR, DEPARTMENT OF LAND RECORDS AND AGRICULTURE, ASSAM,

To

THE CHIEF SECRETARY TO THE CHIEF COMMISSIONER OF ASSAM.

Dated Shillong, the 15th June 1920.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 31st March 1920.

I have the honour to be,

SIR,

Your most obedient Servant,

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

(Prescribed maximum length—12 pages).

CONTENTS.

CHAPTER I.

ADMINISTRATION.

	Para.
Director	1
Expert staff	2
Provincial establishment	3
Subordinate establishment	4
Departmental buildings	5
Expenditure and receipts	6

CHAPTER II.

AGRICULTURAL EDUCATION.

Apprentices on Government Farms	7
Sabour Agricultural College	8

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—AGRICULTURE.

Experiment Stations	9
Soil investigations	10
Sugarcane	11
Sugarcane cultivation by steam tackle	12
Rice	13
Potatoes	14
Jute	15
Pulses	16
Green manure crops	17
Fodder crops	18
Fruit	19
SECTION II.—AGRICULTURAL CHEMISTRY ...	20
SECTION III.—ENTOMOLOGY ...	21
SECTION IV.—MYCOLOGY ...	22

CHAPTER IV.

DEMONSTRATION.

Localities...	23
Rice	24
Potatoes	25
Sugarcane	26
Jute	27
Water Hyacinth	28
Terrace cultivation	29
Fruit	30
Pulses	31
Demonstrations by Honorary Correspondents	32

CHAPTER V.

SUPPLIES OF SEEDS, MANURES AND IMPLEMENTS.

Gauhati Seed Depôt	33
Sylhet Seed Depôt	34
General	35

CHAPTER VI.

Cattle breeding	36

CHAPTER VII.

MISCELLANEOUS.

Agricultural publication, etc.	37
Conference and meeting	38
General progress	39
Notice of services	40

APPENDIX.

List of Honorary Correspondents...	I
Statement of receipts and expenditure	II
Glossary...	III

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending 31st March 1920.

CHAPTER I.

ADMINISTRATION.

Director.

I continued in charge of the Department throughout the year and spent 161 days on tour, inspecting all the farms and the demonstrations in Sylhet, Cachar, North Cachar, Khasi and Jaintia Hills, Kamrup and Sibsagar. I attended the meeting of the Board of Agriculture at Pusa in December and accompanied the Indian Sugar Committee in their tour in Assam. I visited Calcutta in connection with the disposal of the Kamrup farm and to meet the Jute Mills' Association to discuss the extension of jute cultivation in Assam and our system of compiling the jute forecast.

Expert staff.

2. Mr. Meggitt was Agricultural Chemist during the year. Mr. Birt having worked as Deputy Director, Assam Valley, only till the end of June 1919 proceeded on long leave owing to ill-health: his charge of the Jorhat and Kamrup farms was re-transferred to Mr. Meggitt and the control of district demonstration work in the Assam Valley, the Entomological Assistant and the Seed Depôt at Gauhati to Srijut Lakheswar Barthakur, Superintendent of Agriculture, who was appointed to act in his place.

Mr. McKay having resigned the Indian Agricultural Service, Mr. J. N. Chakravarty, a Superintendent of Agriculture from Bengal, acted as Deputy Director, Surma Valley, from 16th May 1919.

Mr. Meggitt was on tour for 73 days and visited the Kamrup farm several times. He attended the meeting of the Board of Agriculture and accompanied the Indian Sugar Committee during their tour in Assam. He also attended a meeting of the Assam Valley Branch of the Indian Tea Association in connection with the proposal to grow cane on waste areas of tea estates. Messrs. Birt and McKay during their short periods of incumbency spent 43 and 41 days, respectively, on tour. Mr. J. N. Chakravarty was on tour for 229 days. He visited Dacca to see the rice experimental work and went to Comilla to see the Water Hyacinth operations under the District Board. A considerable part of his time was taken up in organising measures for the destruction of Water Hyacinth. Srijut Lakheswar Barthakur spent 187 days on tour. He visited Calcutta to arrange for the supply of sugar mills and pulse seeds for the Gauhati Seed Depôt. The headquarters of the Deputy Directors, Surma and Assam Valleys, were transferred during the year to Sylhet and Jorhat, respectively.

Provincial establishment.

3. Maulvi Fazlul Huq continued to be the Superintendent of Agriculture, Surma Valley, and Babu Satyendra Chandra Dutta, Agricultural Inspector, was appointed to act as Superintendent, Assam Valley, from 20th June 1919, when the permanent Superintendent, Srijut Lakheswar Barthakur was appointed to act as Deputy Director. In the Surma Valley the Superintendent was on tour for 235 days and in the Assam Valley the two incumbents toured 35 and 176 days, respectively: their time was devoted chiefly to managing seed depôts, organising and supervising demonstrations and visiting the Honorary Correspondents of the Department. Maulvi Fazlul Huq was also in charge of Water Hyacinth operations. Satyendra Babu visited Karimganj farm and attended the motor tractor trial at Nagpur.

The Hon'ble Mr. Holder was in charge of the Shillong Fruit Station. Mr. Chaston continued as Manager of the Kamrup farm till the end of the year, when his

services terminated with the transfer of the farm to the Assam Sugar Estates and Factories, Limited. The farms at Jorhat, Karimganj and Upper Shillong were in charge of the three former managers and the Entomological Assistant continued unchanged.

At the end of the year the total number of Agricultural Inspectors was ten, including the Agricultural Assistant at Sadiya; one post was vacant owing to the transfer of an Inspector to the Industry Department. I have to note with regret that the Fruit Inspector, L. Harry Singh, having served this Department for 12 years, died in August last: his post could not be filled in for want of a trained man. Since the close of the year four stipendiaries have passed successfully from Sabour College and I have submitted proposals for their appointment as Agricultural Inspectors. When they are posted after training, all the subdivisions of Sylhet, the remaining plains districts and Khasi and Jaintia Hills will be provided each with an Inspector according to the scheme outlined in 1914.

Subordinate establishment.

4. During the year 35 Demonstrators were employed, of whom 14 were attached to the Assam Valley plains, 1 to Garo Hills, 9 to Surma Valley plains, 4 to the Khasi and Jaintia Hills, 1 to the North Cachar Hills and 2 each in Lushai and Naga Hills and Sadiya Frontier Tract. The main duty of Demonstrators continued to be assistance to the Inspectors in organising and carrying out demonstration work.

Departmental buildings.

5. With a view to constitute Jorhat as the departmental research centre of the Province, the Chief Commissioner has sanctioned a scheme for the construction of three residences for the Agricultural Chemist, Deputy Director and the Economic Botanist, quarters for the experts' assistants and staffs and for the extension of the existing laboratory to provide for the Botanical and Entomological research work. The detailed plans and estimates for the projects have all been passed and funds have been provided for the residence of the Agricultural Chemist and the laboratory extension. As there is a large surplus left after the disposal of the Kamrup farm, I hope that funds will be provided for the remaining buildings which are very urgent. For example the posts of Economic Botanist and an additional Deputy Director have been sanctioned by the Secretary of State and officers are being recruited, so that they may join before the end of the present calendar year.

Expenditure and receipts.

6. The expenditure of the department was Rs. 3,08,066-8-5 and the receipts Rs. 56,397-1-9 against Rs. 2,45,298-6-5 and Rs. 22,336-8-6, respectively, in 1918-19. The financial heads of receipts and expenditure are shown in Appendix II. The large increase in the former is due to the fact that the seed depôts realized no less than Rs. 32,022-10-10 by the sale of seeds, plants, manures and implements against Rs. 10,596-13-6 in the previous year. A sum of Rs. 5,675 was credited, after adjusting advance payments, for the price of cane supplied on the Kamrup farm for the manufacture of sugar: other farm receipts were higher than in last year. The Kamrup farm and the expenditure on account of the purchase of seeds, plants, implements and manures by the seed depôts were mainly responsible for the increase in expenditure: a sum of Rs. 3,710 was spent on Water Hyacinth operations in the Surma Valley. It is gratifying to note that the seed depôts at Gauhati and Sylhet with grants of Rs. 3,000 each carried out transactions to the amount of Rs. 24,488 and Rs. 15,246, respectively, on account of their debit of receipts against expenditure.

CHAPTER II.

AGRICULTURAL EDUCATION.

Apprentices on Government farms.

7. The training of apprentices to be employed as Demonstrators lasts two years and is thoroughly practical. At the close of the year there were six apprentices each at the Karimganj and Jorhat farms while the Upper Shillong farm had two. The posts of two apprentices at the Fruit Station have been abolished. An apprentice is trained annually at Lushai Hills. The training of the two Lushai Demonstrators received at Pusa in 1912 having proved inadequate for practical purposes in a hill district, it was decided that they should undergo further training at the Upper Shillong farm: one completed his training last year and the other is taking his at present.

Sabour Agricultural College.

8. Higher training continues to be given at the Bihar College at Sabour, where scholarships of Rs. 20 per month are tenable by inhabitants of this Province. Candidates for employment in the Department are first tested and trained on a farm for a year during which time

they receive Rs. 15 per month. No scholarship was granted during the year but our four scholars in the second year, including two Muhammadans, were all successful in the final examination. One Muhammadan and one Khasi were selected for training and have been granted scholarships this year.

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I—AGRICULTURE.

Experiment Stations.

9. The five experiment stations continued unchanged up to the close of the year. The farms at Jorhat, Karimganj and Upper Shillong are mainly devoted to experiments with sugarcane, rice and potatoes, respectively, while that in Shillong is the fruit experiment station. The fifth was the Kamrup farm for sugarcane cultivation on a factory scale with steam tackle, which has been handed over with effect from 1st April to the Assam Sugar Estates and Factories, Limited: but our Department will advise, when invited to do so, and will have access for the purpose of inspecting its working and of publishing results of interest to the public from an agricultural point of view. The Chief Commissioner visited the Jorhat farm during the year. The long deferred proposal for a rice farm in the Assam Valley is coming to maturity and with the approval of the Chief Commissioner, who agreed to the principle of our concentration at Jorhat, we are endeavouring to procure a site near the Jorhat farm: more detailed proposals will, I hope, be submitted after I have personally examined and selected sites in the rains.

Soil Investigations.

10. The various experiments which have been in progress now for some years were continued at Jorhat. Laboratory work was resumed in this connection, which has given some very suggestive results for future work, more particularly in connection with the soil nitrogen problem. An account of this will be found in section II. Experiments in liming on Blocks C, G and K emphasize the great length of time over which an initial lime application continues favourably to influence cropping. In regard to the value of large *versus* smaller and more frequent lime dressings, the year's evidence was in favour of the latter. During the first few years the larger initial dressings returned the bigger crops; since about the fifth year the smaller and more frequent doses have given the best results. Other experiments continue to prove that for most farm crops it pays not to incorporate lime too deeply. The resistance of crops to soil acidity in the seedling stage appears to be a much more potent factor in deciding on the depth of a moderate lime application than the rooting habits of the crop. The field work designed to elucidate the reasons underlying the remarkable effect of lime on our soils was continued. The results which continue to come out year by year are the positive value of basic manures, followed by the beneficial effect of phosphoric acid, more particularly in its basic forms, the toxic effect of the continued use of sulphate of ammonia without lime and the failure of certain artifical manures, *e.g.*, the commercial nitrates, potash salts and superphosphate, applied singly or in mixtures year by year, to produce a cold-weather crop of oats in the absence of lime. The mineral phosphate experiments in the cane rotation have been carried through the first complete course on four cane areas. Summarising the results to date one would say that in regard to the cane the effect of the phosphate is inconclusive, but very positive on the rape crop and also well marked on the green crop and oats. An experiment in Block M on the value of ground limestone for cane resulted in the limed area yielding 30-35 tons cane per acre against 10-15 tons on the unlimed block, other treatment and manuring being identical.

Sugarcane.

11. The work at Jorhat includes the importation, testing and selection of varieties under chemical control, manurial experiments, and the distribution of suitable varieties to cultivators. Some 65,000 setts of B 376, B 147, Striped Mauritius and J33*a* were sent out from Jorhat. The latter was distributed for the first time and promises well, but being very hard is not a chewing cane and will give poor extraction in wooden mills. The season was very favourable for growth, record plant cane crops being obtained, but a poor one for ripening. Ten varieties were experimentally grown. The average yield for the ratoon crop was 22 tons stripped cane per acre, while the plant cane gave 39·5 tons average on the phosphated area as against 37·5 tons for the unphosphated area. All inter-cultivation was done with a 3 tyned spring

cultivator using a single bullock, which does admirable work. In the ratoons J33*a* gave the largest crop, and returned the highest yield of sucrose in extracted juice. Striped Mauritius and B376 gave good crops, which were however badly lodged and damaged by storms, which reduced quality. B3412 is a heavy ratooner, but poor in sucrose at Jorhat. The plant cane crops were exceptionally heavy, but below the usual quality. B147, B376 and Striped Mauritius continued to yield very heavy crops, as also some of the newer importations *e.g.*, Barbadoes A, B3412 and J33*a*. Of the newer ones J33*a* is the best in quality. Barbadoes A returned the biggest crop, the average for four plots being 50·5 tons per acre, but the quality was low. The highest yield of sucrose per acre in juice extracted was 11,000 lbs. for B147, followed by Striped Mauritius with over 10,000 and J33*a* over 9,000 lbs. B3412 and Barbadoes A returned about 10,000 lbs. sucrose in juice, but the juice was less pure and of lower quality than that of B147, Striped Mauritus and J33*a*. Some thirty new varieties were grown for observation and preliminary analysis and selection Some show exceptional promise as croppers or quality canes or both combined, and these have been introduced now into the variety trials. Amongst the more promising may be mentioned D74, Co9, White Mauritius, J139, J213, A2a.

Sugarcane cultivation by steam tackle.

12. The experiment in Kamrup was continued. No new land was broken up. The total area under cultivation being 817 acres. Of this some 469 acres were under cane, *i.e.*, ratoons 230 and plant cane 239 acres. We were again impressed by the want of extra power implements to relieve the steam tackle of light work necessary in connection with other crops in the rotation: towards the end of the year one Fordson tractor with a 2 furrow Oliver plough and a disc harrow were received, but too late to be of much use. The planting season was very unfavourable owing to the long continued and unusual drought. Germination was none too good, and to add to our troubles a devastating epidemic of beetles attacked the young crop and damaged large sections of it. The cane came away again to some extent, but too late in the season to make a crop. The pest was studied on the spot by an assistant to the Imperial Entomologist and the local Entomological Assistant, and is being further worked out at Pusa by the Imperial Entomologist. Apparently its habitat is in the roots of the grasses and wild canes which abound in this tract, and it may prove a constant danger to be fought against in consequence. Intensive cultivation in the cane area itself, combined, if possible, with the keeping clear of a wide belt around the cane lands, suggest themselves as possibly the most likely measures of prevention. Harvesting commenced in February 1920 for planting. The factory worked for about a month from mid-March to mid April, the amount of cane supplied up to the 10th April being only some 1,157·5 tons. The crop was a very short one for reasons above stated, the average outturn for these blocks weighed off for factory purposes being about 6 tons stripped cane per acre only: it however, amounted to as much as 15—20 tons per acre on parts of two blocks which escaped beetle attack. The average percentage of sucrose in all cane sent to the factory was 13·73 per cent (weighted). The sucrose contents of the three varieties separately were B376 14·64 per cent. on cane, 13·5 per cent., Striped Mauritius 14·77 per cent. The average extraction in the factory was about 68 per cent., the juice showing an average purity of just under 90 per cent. The average weighted percentage for sucrose on cane would have been higher but for the fact that a lot of mixed varieties were sent to the factory which had been lying about in the harvested fields uncollected for sometime and had fermented in consequence. A number of new varieties were planted in the nursery and tested. Many of these show much promise. The highest sucrose content was given by B208, B6450, Red Java, W. M. No. 3 and Red Mauritius. Some of the biggest croppers, *e.g.*, Barbadoes A and B3412, are less rich in sucrose, but are not lower than reported figures for Java. Some lack constitution, notably B208. For the 1920-21 crop the area under cane is 434 acres. An extensive scheme of manurial experiments was initiated and, it is hoped, will be continued by the Company. On seven cane areas nitrogen, 60 lbs. per acre, was used in different forms, some of the manures used supplying phosphoric acid also from 30—75 lbs. per acre. A detailed manurial experiment on block 4 combines the use of ground lime stone, phosphoric acid 40 lbs. per acre as basic slag or superphosphate, and various forms of nitrogenous manures supplying 60 lbs. nitrogen per acre.

Rice.

13. Rice selection work continued for the sixth year at the Karimganj farm. Single pure line selection from 56 varieties of *aus* and from 105 varieties of *sail* were grown on the farm for comparison. During the year three of the most promising selections of *aus* and four of *sail* were tested on an exhaustive scale against a standard in each case. Amongst the latter *Indra sail*, which was the standard used, has come out the best. Among the *aus* we are not yet in a position to recommend any variety without further tests,

which will be continued with the addition of three *sail* varieties. In order to test the selected varieties on a larger scale before recommending them to the ryots, they were grown on a number of plots of one-tenth acre each during the last two years, and yielded 2,546 lbs., 2,230 lbs. and 2,364 lbs. in case of *Indra sail*, *George sail* and *latisail*, respectively. These experiments will be continued with the addition of two best local varieties. The experiment with flood resisting varieties will be carried on and selection work with *asra* and *boro* paddy will be taken up from this year.

Potatoes.

14. The acclimatizing, testing and distribution of potato seeds continue to be the principal work of the Upper Shillong farm. Altogether 23 varieties were under test in the past season. King of Potatoes, Magnum Bonum, Windsor Castle, Up-to-date and Imperator still continue to give the heaviest yields. Owing to the transit difficulties during the war very few new varieties could be imported: but besides the three varieties obtained from Messrs. Sutton and Sons in 1918, eighteen new varieties were obtained last year: these 21 varieties are now under trial. The six main varieties were grown on a large scale for the supply of seed: 5·8 tons were sold to the Khasi cultivators, but many of them are now keeping their own seeds. There is a great demand both from the hills and the plains districts and from outside the province for our selected seeds. In order to meet this demand as far as possible seeds were distributed from the farm to Khasi cultivators who undertook to keep the seed pure and to return from the crop one and a half times as much as the seed supplied. As an experimental measure 5·5 tons were distributed during the last year and 7·2 tons were received back. This year 7·7 tons have been distributed on the same system. The sprouted summer seeds have given at least as good, and sometimes a higher outturn than winter seed and promises to solve the question of economically preserving seed at the altitude of the farm. Manurial experiments have not yet given any definite result. Both the experiments will be continued.

Jute.

15. The Bengal variety, *Kakaya Bombai*, has again shown its superiority over the local varieties at the Karimganj farm. The manurial tests with bonemeal, ground limestone and Water Hyacinth ash were continued. This variety was grown on 5 acres for seed in the Kamrup farm and yielded about 740 lbs. of seed per acre.

Pulses.

16. Varieties of pulse crops were grown at Jorhat to test the value of early *versus* late sowings and most of these show that early sowing is necessary to get good crops. The Rangoon bean was tried on a field scale, but the results were not promising: it appears to be well suited to garden cultivation and is a heavy cropper on good soil. A new pulse the "Para Pea", a small seeded variety of cowpea, was tested both as green crop and as pulse and promises well.

Green-manure crops.

17. New green crops or new varieties of existing ones are regularly experimented with on the Jorhat farm. Dhaincha and cowpeas make the best crops and both are used in the cane rotation with excellent results. A variety of cowpea selected some years ago at Jorhat and named "Jorhat Brown" gives a tremendous green crop which decomposes very readily in the soil; it is also a good seeder if sown in the second half of August. A new cowpea, the "Para Pea" was introduced during the year from the West Indies, and gives excellent promise as a green crop and also as a pulse. It is a small seeded variety, and is reported as being very nutritious and palatable. Dhaincha for green manure was sown on several blocks in the Kamrup farm, but on account of heavy rain it was only possible to turn in about half the area under this crop. At Karimganj it has given very good results as a green manure for transplanted paddy.

Fodder crops.

18. The experiments with Rhodes grass and Guinea grass were continued and extended at Jorhat. Both cropped well, Guinea grass leading in the rains. Rhodes grass is much more difficult to establish and needs more subsequent care, but under good conditions it crops more heavily than Guinea grass in the dry cold-weather months. Guinea grass is much more readily established, and gave 28 tons green fodder per acre last year as against 22·8 tons for Rhodes grass. An extended area was planted out with Guinea grass during the year and cropped well. Sudan grass from Australian seed was sown and is doing fairly well. At Upper Shillong *Raishan* is grown for hay and maize for silage, both of which make excellent fodders.

Fruit.

19. The Fruit Experiment Station at Shillong continued to make satisfactory progress. The total area of the garden is 62·60 acres, and out of about 30 acres, which are suitable for fruit

growing, 28 acres have been planted. Good fruit, including numerous varieties of apples and pears, has been produced and about Rs. 874 worth of fruit was sold during the year. The results are promising Arrangements have been made to supply grafts to cultivators in the Khasi and Jaintia Hil's and six orchards were planted out last February for the purpose. In the garden at Tissema in Naga Hills guava, grapes, pomaloes and small Japanese oranges did well. Young trees of guava, orange, mulberry and peach have been distributed during the year.

Section II—Agricultural Chemistry.

20. Owing to the fact that Mr. Birt had to take long leave, Mr. Meggitt again held charge of the two farms at Kamrup and Jorhat for the greater part of the year. A Laboratory Assistant was appointed from July 10th 1919 on probation for training. The number of samples received in the laboratory was 181, comprising 156 soils, 12 Water Hyacinth ashes, 8 manures and 5 samples of fodders, etc. Chemical control of sugarcane work at Kamrup and at Jorhat again occupied most of the Chemist's and his assistant's time throughout the cold weather. In addition to the usual work in connection with the acclimatisation, selection and testing of new cane varieties, a good deal of extra work was involved in connection with the visit of the Indian Sugar Committee, and the elaboration and initiation of a scheme of manurial experiments on sugarcane in Kamrup. Research work on the changes taking place in different parts of the cane stem was continued and is still incomplete. Special laboratory work was undertaken on the Kamrup soils in regard to the influence of carbonate of lime on soil biochemical processes. It was found that ammonification and nitrification were very much improved, both in respect of the soil's original and added sources of nitrogen. Within a period of 60 days the soil alone nitrified some 66 per cent. of added oil cake nitrogen, whereas with carbonate of lime in addition the whole of the added nitrogen was nitrified, the soil moisture content being 16·5 per cent. No nitrification took place under any conditions when the percentage of soil moisture was raised to 23 per cent. As the latter high percentage of soil moisture was actually found to obtain on certain low lying areas during the rains, the importance of good drainage is emphasized. At Jorhat detailed examination of soils of certain experimental areas was initiated, but it is incomplete. Estimations of soil nitrogen of the plots from the permanent liming experiment in Block C show that on the non-green manured block the soil nitrogen has steadily fallen specially on the plots not receiving an annual dressing of cowdung. This is less clear on the green manured block where the average nitrogen content of the plots is now higher than in the corresponding plots of the other block. From a study of those plots which receive lime only, or no lime at all, the evidence goes to show that though crops have been steadily removed from the limed plots for the past 9 years, while the unlimed plots have produced no crops at all, the surface soil of these limed plots contains now a higher nitrogen percentage than the surface soil of the unlimed plots though this was not the case originally, and further that the unlimed plots have lost more nitrogen since 1911 without any crop removals than have the limed plots. This points to one of the two things or both, *i.e.*, (*a*) less loss of soil nitrogen from the limed plots in directions other than as crop removals, or (*b*) the activity in the limed soil of some nitrogen recuperative agency. In either case the effect must ultimately be ascribed to lime. In regard to mineral constituents of the above plots there is no evidence of the present existence of increased amounts of available potash in the limed sections as against the unlimed; removals of this constituent in crops may however account for this. The section cross dressed with bonemeal shows now a much higher available phosphoric acid content. Finally though the unlimed plots show now a higher average content of available potash and phosphoric acid than the corresponding limed plots, they still fail to crop. Further work was commenced on the soil nitrogen problem, and some time was spent on devising and perfecting a field method for studying oxidation processes in the soil and the factors affecting it. Both however await development. A simple scheme for the analysis of Water Hyacinth ash was worked out in connection with the Departments' operations against this pest. Other work included the analysis of soils, ashes, manures, fodders, pulses, etc.

Section III—Entomology.

21. The Entomological Assistant was on tour for 115 days, visiting the districts of Goalpara, Kamrup, Nowgong, Sibsagar and Sylhet chiefly to attend outbreaks of various insect pests and to help in the entomological work on the farms. An investigation of the beetle pest at Kamrup was made with the assistance of Mr. C. C. Ghosh, the Entomological Assistant of Pusa.

A brief account of the work done is given below:—

(1) *Paddy pests.*—Rice hispa (*Hispa armigera*), rice bug (*Leptocorisa Varicornis*), and rice stem borer (*Schoenobius bipunctifer*) appeared in both the valleys. In the Karimganj Farm rice hispa and rice bug were combated by the use of hand bags and the stem borer by light traps. Near Nalbari in Kamrup a few cultivators took to hand bags against the rice bug. Army worm and swarming caterpillars were not serious as in previous years.

(2) *Pests of oil seed crops.*—Mustard aphis and mustard sawfly (*Athalia proxima*) were reported from Kamrup, Sylhet and Jorhat. Dusting with lime and powdered soil sprinkled with kerosine oil was recommended against the latter. Bihar hairy caterpillar (*Diacrisia obliqua*) and castor semilooper (*Ophiusa melicerte*) were found as usual pests of castor plants.

(3) *Pests of fibre crops.*—The Bihar hairy caterpillar was most troublesome in jute in both the valleys. Crickets were reported as injurious to jute seedlings in Kamrup and Goalpara and white ants in the latter.

(4) *Tobacco pests.*—Cut worms (*Agrotis Ypsilon*) were found to be injurious to young plants in Goalpara. Hand picking of caterpillars in the early morning was effective to those who practised it.

(5) *Fruit pests.*—A weevil (*Odoiporus longicollis*) has been found to cause damage to plantain trees. The larvae bore into the stem riddling the whole of it through and through and causing death to the plant. Destruction of the affected plants to check its spread appears to be the only satisfactory control. The treatment of orange trees against the mealy bug by keeping the base of the trees clean has been adopted with good results by some people in Sylhet. The pentatomid bug (*Rhynochocoris sp*) has been found to be a general pest of orange fruits. Trapping them with a stick coated with gum and entertaining tree red ants to prey on them are the only measures to be recommended at present. Mites (*Eriophyes sp*) were found to be serious in litchi trees in the Jorhat Farm; by a thorough pruning and destruction of the affected leaves and twigs the trees were saved.

The removal of the headquarters of the Entomological Assistant from Gauhati to the Jorhat Farm has proved a great advantage. He was able to keep a regular watch on the entomological problems of the farm as well as to secure better facilities for studying pests. By regular watch and destruction of the young shoots of sugarcane affected by borer the cane crop was kept almost free from the attack. The fruit trees of the farm also received constant attention.

Section IV—Mycology.

22. During the cold weather there were reports of *Phytopthora* blight of potatoes all over the Assam Valley, but it was serious only in limited area. Unusual as it is to have serious outbreaks of potato blight in the plains the reports came in rather late. A small campaign with Burgundy mixture was carried on in the potato tracts near Kokilamukh and Gelabil in Sibsagar. As a result of this experience arrangements have been made to stock spraying machines and chemicals at Jorhat and Gauhati for future demonstrations. Having no separate Mycological staff of the Department advice had to be sought from Mr. A. C. Tunstall, Mycologist of the Indian Tea Association, who not only promptly identified the pest, but very kindly lent his sprayers and some chemicals.

CHAPTER IV.

DEMONSTRATION.

23. During the year demonstrations on cultivators' holdings were carried out under the general supervision of the Deputy Directors in all the plains districts except Darrang and Lakhimpur, where no Agricultural Inspector could yet be posted, and in the Khasi and Jaintia, Garo and North Cachar Hills. In the plains and North Cachar the work of the Inspectors and Demonstrators was under the immediate control of the Superintendents. In the Khasi and Jaintia Hills and Garo Hills work is directly under the Deputy Director: in the Sadiya Frontier Tract the Agricultural Assistant works under the orders of the Political Officer and advice is given by the Deputy Director when required. The work in the Naga and Lushai Hills, which consists mainly

Localities.

in extending terrace cultivation, is not yet directly under this Department. During the year I made a detailed and extensive examination of agricultural demonstrations in the Surma Valley and in Kamrup and Sibsagar in the Assam Valley.

Rice

24. In the Assam Valley the residual effect of manures in their third year after application was continued under observation in Sibsagar and Kamrup. In the first series in Sibsagar bonemeal gave an average increase of 337 lbs. per acre, flour phosphate 154 lbs., flour phosphate plus dhaincha green manure 251 lbs., bonemeal plus green manure 196 lbs. and dhanciha green manure 263 lbs. The total average increase for the three years was for bonemeal 1,532 lbs. per acre, flour phosphate 1,417 lbs., flour phosphate plus green manure 1,284 lbs., bonemeal plus green manure 1,406 lbs. and green manure alone 538 lbs., and leaves a nett profit of, Rs. 47-8, Rs. 42, Rs. 35, Rs. 41 and Rs. 18 from the different manures, respectively. In the second series in Sibsagar bonemeal gave an average increase of 192 lbs. per acre and flour phosphate 315 lbs., the total average increase over the three years being 723 lbs. per acre for bonemeal and 797 lbs. for flour phosphate which gives a nett profit of Rs. 26-8 from the former and Rs. 29-8 from the latter. In the Kamrup demonstrations bonemeal plus green manure gave in the third year an average increase of 259 lbs. per acre, while the corresponding increase from green manure alone was only 9 lbs. Taking the aggregate results of the three years bonemeal plus green manure shows a profit of Rs. 40 per acre and green manure alone Rs. 16. In the same two districts the results of the residual effect of manures in the second year after application were recorded. In Sibsagar bonemeal gave a total increase of 592 lbs. per acre and flour phosphate 1,001 lbs. in the two years. In Kamrup the average increase in the second year due to bonemeal plus green manure was 100 lbs. per acre, to green manure alone 113 lbs., and to oil cake 154 lbs. The total increase for the two years amounted to 348 lbs. per acre for bonemeal plus green manure, 260 lbs. for green manure alone, and 540 lbs. for oilcake. The results of oil cake manuring in Kamrup are quite striking. The results of these demonstrations, when critically examined, divulge a good deal of irregularity and cannot be regarded as in any way conclusive. These demonstrations will be continued for another year under observation so that their economic value can be better judged.

A large number of new paddy manurial demonstrations on the same lines as in previous years were laid down in 1919 in Kamrup, Sibsagar, Nowgong and Goalpara. In the majority of cases the results of the first year alone show a wide margin over the cost of manures; moreover the effect of at least the phosphatic manures should last for three years or more. The average increase for bonemeal was 129 lbs. per acre in Sibsagar, 275 lbs. in Goalpara and 349 lbs. in Nowgong; for flour phosphate 526 lbs. in Sibsagar and 248 lbs. in Goalpara; for flour phosphate plus dhaincha 693 lbs. in Sibsagar, 404 lbs. in Kamrup and 503 lbs. in Nowgong; for green manure alone 173 lbs. in Sibsagar, 317 lbs. in Kamrup and 791 lbs. in Nowgong and for oil cake 236 lbs. in Sibsagar and 139 lbs. in Kamrup.

These paddy manurial demonstrations have been carried out for the last seven years in the districts of Kamrup and Sibsagar and gradually extended to Nowgong and Goalpara as they were brought under the activities of the Department. The results clearly show that their use pays handsomely in the long run. But that the cultivator is exceedingly slow to appreciate their value is evident from the smallness of their demand. The reason is not far to seek: want of enterprise and lack of capital are directly responsible for this indifference. Besides there is no pressure of population to drive people to take to more intensive cultivation. But the present system of growing paddy from year to year without manuring or rotation has reduced the outturn on the higher paddy lands in many a tract to such a level that it no longer pays to cultivate them. Artificial manures should be very useful on such lands and their result should appeal to the cultivators and be appreciated by them soon. Demonstrations with Mr. Hector's selected variety *Indra Sali* and *George Sali* of Rai Sahib Narayan Baruah were continued during the year on a larger scale in Kamrup, Sibsagar and Nowgong and extended to Lakhimpur and Goalpara. Both of these gave promising results, *Indra Sali* yielding an average increase over local paddies of 78 lbs. in Kamrup, 337 lbs., in Nowong, 168 lbs. in Sibsagar and 100 lbs. in Goalpara, and *George Sali* 166 lbs. in Kamrup, 284 lbs. in Sibsagar and 229 lbs. in Goalpara. In order to spread these varieties as widely as possible arrangements have been made to deal out during the coming rains 85 mds. of the former and 22 mds. of the latter for demonstration and distribution in 5 seers packets.

In the Surma Valley the bonemeal demonstrations are restricted to poor soils. Used alone, bonemeal has given fairly satisfactory results in Habiganj, Karimganj and Silchar, but not in North or South Sylhet. Coupled with an organic manure, however, such as dhaincha or oilcake, bonemeal has usually proved profitable even during the first year. In South Sylhet in the first year an expenditure of Rs. 10 has given an increased crop to the value of Rs. 42. The effect of bonemeal for increasing the outturn of paddy in the Hills is, however, quite distinct and definite and its use is rapidly becoming an established practice among the paddy growers in the Khasi and Jaintia Hills. The increase obtained from plots where bonemeal was applied for the first year left a profit of Rs. 6 and in plots treated last year the profit amounted to Rs. 31 for the two years. On upland paddy, however the margin of profit left is so small that the cultivators hardly think it worthwhile to take the trouble. Thirty four tons of bonemeal were sold in the Khasi and Jaintia Hills, but the recent rise in price has made its use almost prohibitive.

Potatoes.

25. Demonstrations were carried out in the Surma Valley to test the Shillong potatoes against country varieties: the former gave increased outturns of 1,801 to 2,718 lbs. per acre. On account of the heavy rains, however, both the country and Shillong potatoes were spoiled in many places. Nearly 10 tons of Shillong potatoes were sold in the plains during the year and the demand is gradually increasing. In Cachar large seeds gave an outturn of 1,844 lbs, over small seeds. In North Cachar summer potatoes proved a failure. In the Khasi and Jaintia Hills the superiority of farm seeds over local varieties was demonstrated in 14 centres.

The superiority of the Shillong potatoes has been well established in the Province, and that their reputation has spread outside is evident from the figures of exports given below:—

1912-13	5,395	tons.
1913-14	4,081	„
1914-15	6,706	„
1915-16	4,276	„
1916-17	3,768	„
1917-18	4,297	„
1918-19	3,093	„

To push on the introduction of potato cultivation to new localities in the Assam Valley a number of demonstrations was carried out in Lakhimpur, Nowgong, Kamrup, Goalpara and Garo Hills. The average increase in favour of Shillong varieties over the *deshi* variety was 1,469 and 1,444 lbs. in Kamrup and Nowgong, respectively.

Sugarcane.

26. In the Assam Valley Striped Mauritius, B147 and B376 have everywhere proved their superiority over the local kinds and are highly appreciated by the cultivators. The demand for the setts was larger than in last year but there was not adequate means to meet it entirely, the supply from the Kamrup farm being cut off. The solution is the establishment of local centres of distribution and this we have taken in hand for some time. About 65,000 setts were secured from the Jorhat farm and nearly one lakh from these outside centres and distributed in hitherto untouched areas. A few demonstrations in Nowgong and Kamrup gave an average increase of 1,130 and 1,037 lbs. of *gur* per acre, respectively. There was a considerable demand for sugarcane mills, 141 being sold this year against only 38 in last year. This was evidently due to the increased attention being paid to sugarcane, which has become a very profitable crop owing to the present high price of *gur* and sugar. The use of the shallow *gur* boiling pan is also appreciably increasing and 33 were sold during the last cold weather.

The demand for setts of the improved varieties has been increasing in the Surma Valley, but it is difficult to meet it. Efforts are being made to grow the required setts in the valley through the cultivators and 30,000 setts have been distributed on condition that the cultivators should keep them pure and return the number supplied after next harvest.

In Lushai Hills a certain amount of local sugarcane is regularly grown and during the past year there has been a comparatively large extension of cultivation near Aijal. Thousands of sugarcane cuttings were distributed in the Sadiya Frontier Tract.

Jute.

27. *Kakaya Bombai* is rapidly becoming popular in the jute tracts in Sylhet, Goalpara, Kamrup and Nowgong. It was tried against the local varieties and gave increased outturns of 121 to 495 lbs. per acre in Sylhet, 405lbs. in Goalpara, 376 lbs. in Kamrup and 378 lbs. in

Nowgong. To meet the growing demand for seed a supply of about 1¾ tons was grown on the Kamrup farm, and 653 lbs. was grown by an Honorary Correspondent and has been mo tly distributed for the present season's sowing. About 2½ tons of seed were purchased for the Surma Valley and this has mostly been sold recently in Habiganj subdivision. Arrangements have been made for a larger supply of seeds for both the valleys from the Angarakhata Fibre Estate in Kamrup. As regards manurial experiments in the Surma Valley the use of bonemeal at 246 lbs. per acre increased the outturn by 263 lbs. in South Sylhet and 638 lbs. in Habiganj, which is the main jute growing area. At the same place the application of Water Hyacinth at 492 lbs. per acre gave an increased outturn of 369 lbs. As bonemeal cost Rs. 81 per ton and Water Hyacinth ash Rs. 54 per ton the use of these on jute would appear to be highly profitable. These demonstrations are being extended.

Water Hyacinth.

23. This pest continues to spread in the low-lying tracts of the Surma Valley, where it appears to have established itself five or six years ago. Experimental work was started in 1917 to endeavour to discover a means of checking its spread and has been continued since, the object being primarily to destroy the weed, and at the same time, to find out something of the value of ash as manure and to gain information as to the probable cost of the work of eradication. In the cold weather of 1917-18 a small quantity of ash was prepared, which, on an analysis, showed from 9 % to 12 % of potash. Part of the ash was sent to tea gardens where it was applied to green manure crops with fair results: on jute the results were good, but we failed to find a use for it as a potash manure, Calcutta firms reporting it to be too low a grade. In 1918-19 25 tons of ash was prepared and supplied to tea gardens. With a view to determine whether the extraction of potash salt would be more economical, an installation for extracting potash was set up at Kaliarbhanga in Habiganj during the year under report. On account of excessive rain in November, the impossibility of securing labour during the rice harvest in December and the not unusual early rain in February, enough fuel and ash could not be procured to work the installation throughout the season: 1,429 lbs. of salt was produced from 14 tons of ash at a cost of Rs. 692-10-0, equivalent to Rs. 1,092 per ton exclusive of capital and supervision charges. The only quotation for salt received was Rs. 22 per ton at Calcutta, equivalent to Rs. 200 per ton *in situ* and it is clear that there can be no profit from this scheme. The total quantity of ash handled at Kaliarbhanga was nearly 52 tons disposed of as follows:—

	Tons.
For salt manufacture	14
Supplied to tea gardens	30
Supplied to Scientific Branch, Indian Tea Association	0·27
For demonstrations	0·58
Loss by rain and wastage	6 9

In addition 23·5 tons of ash were supplied through us to tea gardens by the Habiganj and Sunamganj Local Boards. The average potash content of our ash was 6 per cent., that of the Habiganj Board under 4 and that of the Suuamganj Board 2·7, so that our supply was not much better than any ordinary ash and that of the Boards was worse. The Chief Scientific Officer of the Indian Tea Association cancelled the balance of his indent as he considered it uneconomical to use such bulky low grade material. Our experience clearly shows that the larger the quantity of the weed dealt with, the lower is the value of the ash: we have steadily depreciating results every year since we began. Our efforts to supply tea gardens have met with response from only one company and we have had to pay the freight amounting to Rs. 22 per ton on our consignments; it is unlikely that we shall receive any orders next year. The nett result of the operations in last year was that on an expenditure of Rs. 4,898 we have made a loss of Rs. 3,085, allowing for the value of our materials and probable sale proceeds. A great deal of the time of the Deputy Director and Superintendent was taken up with the work to which special attention was paid. With the low value of the potash salt, which we shall apparently find extremely difficult to sell, and the practical worthlessness of the ash, I am forced to the conclusion that we should follow the example of Bengal and cease our efforts to diminish the spread of this weed, which has nowhere any injurious effect on agriculture. So far as we are concerned we can recommend its use as a manure on jute and kachus, but its bulky nature must restrict it to places near the swamps where it is propagated: this being a strictly agricultural object comes within our sphere of action. The main danger of the weed is the obstruction of water ways, as is shown by the experience in the United States and Burma, and is a problem which would more appropriately belong to the

waterways Board, if such is established. So far as the Surma Valley is concerned it seems to me as an amateur that the sudden fall of the flood level at the end of the rains will tend to ensure that the main channels will always be kept clear.

Terrace cultivation.

29. In the Sadiya Frontier Tract two Angami Naga Demonstrators continued in their endeavours to spread their native system of terraced rice cultivation among the Abors, but the Political Officer finds that the latter are not responsive and intends changing his scene of propaganda to the Digaru Mishmis. The system of terracing is reported to be increasing in popularity in the Naga Hills and the terraces are improving as they get older : considerable extensions were made in the Upper Diku Valley and the Tizu Valley, but half of the terraces in Mokokchung village were ruined by a slip. In the Lushai Hills the results were unsatisfactory on account of the dry spring. Personally I see no prospect of success except in places where pressure of population forces the people to give up perpetual migration, even when physical facilities exist.

Fruit.

30. On the death of the Fruit Inspector the Agricultural Inspector, Khasi and Jaintia Hills, was placed in charge of the work which was restricted to that district, where six small orchards on cultivators' holdings were started with grafts supplied from the Fruit Experiment Station at Shillong. The cultivators provide the land and labour and will get the produce. If these are successful, there should be ample room for large extensions in the district. Five hundred orange seedlings and a few grafts of other fruit trees were supplied during the year. The orchards at Sadiya and in the Naga Hills are reported to be doing well. Pine apple and orange growing are reported to be an established industry now in the Lushai Hills and all seedlings and suckers which can be produced at the Dhobi Nala garden are readily sold.

Pulses.

31. In the Surma Valley the propaganda for the extension of pulse crops has met with considerable success, but in the Assam Valley the results have not been so good partly because a good deal of pulses are already grown and the indigenous cultivators have not yet realised that there is a big demand from the foreign population. Leaflets on the cultivation of pulses have been distributed to all tea-garden managers with a view to making their labour force more self-supporting than they are.

Demonstration by Honorary Correspondents.

32. We have 35 Honorary Correspondents against 31 in the previous year : there were 8 new appointments and 4 names were struck off. Three of our Honorary Correspondents, U Bordhon Roy Kanti of Cherrapunjee, Maulvi Tayab Ali of Sonapur and Babu Bishnu Charan Dutta of Tura died during the year. Mr. Ferguson of Dhamai grew *Kakaya Bombai* jute seed and used Water Hyacinth ash with good results. He distributed some jute seed among the local cultivators and gave a small quantity to the Department. Rai Sahib Joynath Nandi of Bejura rendered very notable assistance in the sale of potatoes, pulses and jute seed in Habiganj and has recently been honoured with a title in recognition of his services. Maulvi Abdul Waheb Choudhuri experimented with bonemeal and dhaincha with good results and helped us in selling about 1 ton of bonemeal and 124 lbs. of dhaincha seed. Srijut Deveswar Goswami of Badlipar supplied us with 20,000 setts of Striped Mauritius and is growing turmeric and arrowroot on a commercial scale. Rai Sahib Narayan Barua of Sibsagar distributed Garo cotton seed and his *George sali* rice : he has recently been honoured with a title for his segregation and distribution of the latter. The late Maulvi Tayab Ali of Sonapur grew *Kakaya Bombai* jute and supplied the Gauhati Seed Depôt with 657lbs. of seed.

Now that we have to some extent awakened the interest of the cultivators by actual demonstrations and developed the distribution of improved varieties of seed, there is an increasing scope for the assistance of non-official gentlemen in growing pure lines of seed for distribution among the cultivators. It is gratifying to note in this connection that Hon'ble Mr. Kamini Kumar Chanda at my suggestion purchased from us 1,000 lbs. of *Kakaya Bombai* jute seed and distributed among his tenants.

CHAPTER V.

SUPPLY OF SEEDS, MANURES AND IMPLEMENTS.

Gauhati Seed Depôt.

33. The quantity of seeds, manures issued during the year was about 71 tons and the number of implements 231, the total having an aggregate value of Rs. 25,580. Of these 56·5 tons of seeds and 207 implements were sold to the public and the price realised : the remain-

der was distributed free for demonstration purposes and to our farms. Amongst seed the chief item of supply was 50 tons of Shillong seed potatoes against 30 tons of last year, of which 45 tons were actually sold. Of implements the main issues were iron sugarcane mills, of which 141 against 38 in last year were sold and 5 were utilized for demonstration. The sale of small seed packets of cold weather vegetables grew in popularity and promises to be an useful line of work. The total liabilities of the depôt for the year ending 31st March 1920, amounted to Rs. 25,222 of which Rs. 24,488 were incurred on account of the purchase of seeds, manures and implements and Rs. 915 for the stores supplied from farms. The total receipts were Rs. 25,580 of which Rs. 22,337 were actually realized and credited including Rs. 917 for the previous years, and Rs. 732 was outstanding, which has since been realized in full. The value of the seeds supplied free to the Honorary Correspondents and for experimental and demonstration purposes amounted to Rs. 3,423 and the value of stores in hand was Rs. 2,952. The nett profit on the working of this depôt, allowing for depreciation, establishment, and contingencies, etc., amounted to Rs. 358 against a loss of Rs. 467 in the previous year.

Sylhet Seed Depôt.

34. In the Sylhet depôt seeds, manures and implements to the value of Rs. 12,150 were supplied during the year, of which Rs. 9,745 worth were issued to the public and the rest to farms and for demonstration. The most important of the articles supplied were 16 tons of Shillong potatoes, 3 tons of pulses and oilseeds, 2·5 tons of paddy, 34 tons of bonemeal, 7,654 lbs. of jute seed, 11 sugarcane mills, 6 pans and 10 Meston ploughs. The bulk of the bonemeal was sold in the Khasi and Jaintia Hills. On account of the high prices of pulses and jute seed, they were sold at cost price to extend their cultivation. Three temporary rural seed stores were opened and transacted business to the value of nearly Rs. 4,000. The total charges for the depôt for the year under report amounted to Rs. 18,870 of which Rs. 15,246 was incurred in the purchase of seeds, manures and implements and Rs. 1,809 for the stores supplied from farms. The total receipts credited amounted to Rs. 9,785 including the receipts of the previous years and Rs. 324 was outstanding of which Rs. 95 has been realized since the close of the year. The value of stores supplied free for experimental purposes and demonstrations and at concession rates to Honorary Correspondents amounted to Rs. 2,500 and the value of stores in hand was Rs. 5,470 including a large amount of bonemeal. The nett loss on the working of the seed depôt, after allowing for depreciation, establishment and contingencies, was Rs. 1,252 which was due to the rottage of potatoes, the bad germination of English vegetable seeds and the sale of pulses and jute seeds at cost price.

General.

35. In connection with the proposal for the establishment of a farm to supply our own seeds for sale I have selected a site in Kamrup suitable for growing pulses and other *rabi* seeds. In the meantime I have suggested the Jute Mills' Association that they could help themselves and Government best by running a jute seed farm in Assam, as our main difficulty in extending jute cultivation is to secure sufficient quantity of *Kakaya Bombai* seed. The Association have taken up the suggestion with possible extensions on a large scale in Bengal and have not yet come to a decision. A site has been provisionally selected and if the farm materialises we can procure all our *rabi* seeds from it. The scheme for a general seed farm should therefore await the decision of the Jute Mills' Association.

CHAPTER VI.

CATTLE BREEDING

36. The Upper Shillong herd of Patna and cross-bred cattle has been reduced by weeding. Thirty of the best cows and heifers have been selected and divided into two herds of pure Patna and Patna with a strain of Bhutia blood. The cost of maintaining the herd was Rs. 5,180 and the income from milk amounted to Rs. 1,562. Three breeding bulls and thirty five animals consisting of mixed and old and weedy animals were sold for Rs. 2,907. The number of cattle in the farm was 98 at the end of the year.

Under the Assam Local Self-Government Act a Local Board may provide for the improvement of the breed of cattle. The attention of the Boards was invited to these provisions and they were informed that two yearling bulls would be available from the Rangpur farm in Bengal and one was purchased by the Nowgong Local Board at a cost of Rs. 206. The only other requisition for the bull came from North Lakhimpur Local Board, which asked for a mature bull and stated that the bull they pur-

chased some years ago from the Shillong farm was badly treated and very little appreciated. I am not aware whether any Local Board has formed a committee as suggested, but their very meagre response to the offer of two Rangpur bulls is not promising.

CHAPTER VII.

MISCELLANEOUS.

Agricultural publication and supply of information.

37. As stated in paragraph 31, two leaflets on the cultivation of pulses in the Surma and Assam Valley, respectively, were published and circulated among the managers of tea gardens through the two branches of the Indian Tea Association. A note on fruit culture written by the Hon'ble Mr. C. H. Holder and translated into Khasi was circulated among the cultivators of the Khasi and Jaintia Hills. Reports on the work of each agricultural station and seed depôt and on agricultural demonstrations were published as usual in the autumn.

Various requisitions for information relating to agriculture were received from private individuals and concerns and complied with. Honorary Correspondents were supplied free with copies of all departmental publications and reports and were given information and advice on agricultural matters.

Conferences and meetings.

38. During the year conferences of agricultural officers of the two valleys were held for the first time at the Karimganj and Jorhat farms, respectively. The Chief Commissioner honoured the latter by attending. Various useful matters relating to the Department such as the training of farm apprentices, the aim and programme of district demonstration work and distribution of seeds, etc., were discussed. There was also a gathering of cultivators and other interested at the Jorhat farm under the guidance of the Deputy Director, who was pleased with the results. It is proposed to have a similar gathering at Karimganj and, if successful, to make each an annual occurrence. A probably more useful method of propaganda so far as the ordinary cultivator is concerned was started in Sylhet: the Agricultural Inspectors and Demonstrators were deputed to attend two of the principal fairs where they exhibited a collection of improved seeds, manures and implements which attracted considerable attraction amongst the visitors who were mostly practical farmers.

General progress.

39. As intimated in last year's report we worked this year with Mr. J. N. Chakravarty and Srijut Lakheswar Barthakur as Officiating Deputy Directors and I have much pleasure in testifying to the endeavours made by both to maintain our standard. In view of their newness to their duties I made a detailed inspection of demonstrations on the field and was satisfied with the general trend of the work. In most places I think that the Inspectors, with the best intentions of securing accurate results, rather failed to take account of the human element and did not realise that we have not alone to shew good results, but must also persuade the people by every possible means to adopt our methods. An attitude of social or intellectual superiority does not tend to the friendly and confidential relations with the cultivator which are so necessary if we are to improve him, in many cases almost against his will and certainly contrary to his expectations. This defect, however, cannot gainsay the fact that we have succeeded in gaining the confidence and approval of almost all the comparatively energetic and wide-awake cultivators that I saw; mention of it is made solely with the object of increasing our rate of success with the latter and of securing improvement amongst the more lethargic, who unfortunately are probably in the majority, particularly in the more sparsely populated districts. It is not easy to explain to the public what modicum of success we have secured without giving some figures as an index. The Gauhati seed depôt in the previous nine months realised from sales Rs. 8,959: in the past year it received Rs 22,337 in cash. The receipts of the depôt at Sylhet were Rs. 9,685 in last year against Rs. 5,372 in the previous nine months and, mainly owing to the late sowing season, it had on 31st March seed, etc., in hand of the value of Rs. 5,470, a large portion of which should be disposed of by now. In the Surma Valley for the first time we sold 1·4 tons of bonemeal and 144 lbs. of dhaincha seed for use as manures and there were indents for over one lac of sugarcane setts, of which we were able to supply only 30,000: we sold three tons of *Kakaya Bombai* jute seed and allowing for about another ton saved by the cultivators, the increased value of the outturn in the Surma Valley may be estimated at Rs. 32,000, to which we can add at least Rs. 10,000 from the increase in the rice crop. In the Assam Valley the fact

that we sold for cash no less than 141 iron cane mills against 38 in the previous year at about Rs. 70 each is both an indication of the prosperous season and the growing confidence of the people.

I believe that if we could produce two really striking strains of rice to suit local conditions in the two valleys, we should expand by leaps and bounds: this brings me to the need of having at least one rice farm in the Assam Valley, because neither the Bengal or Surma Valley rices can be guaranteed to succeed there. Our Botanist is, I understand, being recruited and should arrive within the present year.

We require more and more assistance from public spirited gentlemen interested in agriculture in order to procure jute seed and sugarcane setts for sale and distribution; we cannot cope with the demand at present.

40. Mr. Meggitt was again somewhat handicapped by the supervision of Jorhat and Kamrup farms: on his return from leave he should at last be able to confine himself to his legitimate work in the laboratory. The two officiating Deputy Directors, Mr. J. N. Chakravarty and Srijut Lakheswar Barthakur, did well in their new charges. The Hon'ble Mr. Holder and Mr. Chaston continued their good work on the Fruit Station and Kamrup farm. Maulvi Fazlul Huq, Superintendent in the Surma Valley, was particularly successful in gaining the confidence of the Muhammadan cultivators, while Babu Satyendra Chandra Dutta in the Assam Valley had a most successful year in the Gauhati Seed Depôt and did well in demonstrations. Srijut Binaram Das at Jorhat and Babu Surendra Nath Gupta at Karimganj continued their efficient charge of the two farms, while Babu Satya Ranjan Gupta, Entomological Assistant, continues to give satisfaction. My Head Assistant Babu Dinesh Chandra Das, was as usual most helpful and made a very thorough inspection of all subordinate offices, which I hope will make them more efficient.

Notice of services.

We owe a great deal to Mr. Hector, now Imperial Botanist at Pusa, for his helpful advice for the last four or five years in connection with the rice work at Karimganj.

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

APPENDIX I.

LIST OF HONORARY CORRESPONDENTS OF THE DEPARTMENT OF AGRICULTURE IN ASSAM.

SYLHET.

1. D. Ferguson, Esq., Dhamai Tea Estate, Post Office, Dhakinbhag.
2. Babu Girija Nath Biswas, Post Office, Bamiachang.
3. „ Pavitra Nath Das, Post Office, Beani Bazar.
4. „ Bidya Kumar Chawdhuri, Sunamganj.
5. Maulvi Abdur Rahim Chowdhury, Zamindar, village Sultanpur, Post Office, Jalalpur, Sylhet.
6. James Laurie, Esq., Post Office, Nariancherra, Akbarpur, Queen Pine Apple Estate, South Sylhet.
7. Rai Sahib Joynath Nandi Mazumdar, Post Office Bejura, Habiganj.
8. Maulvi Abdul Mannan Chawdhury, Kanihati, Hazipur Post Office.
9. Maulvi Abdul Waheb, Pleader, Maulvi Bazar.

CACHAR.

10. Babu Sarada Charan Chakravarty, B.A., Assistant Inspector of Schools, Silchar.
11. „ Bharat Chandra Das Chowdhury, Salchapra, Cachar.

KHASI AND JAINTIA HILLS.

12. U Job Solomon, Shillong.
13. U Kubur Singh, Mylliem.
14. U MacDonald Gatphoh, Jowai.

GOALPARA.

15. Babu Dijesh Chandra Chakravarti, Manager, Gauripore Estate.
16. „ Lalit Mohan Datta, Dhubri.

KAMRUP.

17. E. P. R. Gilman, Esq., Barduar Tea Estate, Post Office, Palasbari, Kamrup.
18. Munshi Tazul Islam, Sonapur, Gauhati.
19. Srijut Pratap Narian Chowdhury, Mauzadar Khata, Nalbari.
20. „ Chandra Nath Sarma, Pandit, Post Office, Palasbari.

NOWGONG.

21. Babu Jnan Chandra Ray, Baithulongso, Post Office, Kampur.
22. Srijut Bhagadatta Hazarika, Mauzadar, Dharamtul Post Office.
23. „ Balaram Hazarika, Kuorital Post Office.
24. B. Barraclough, Esq., Lumding Post Office.

DARRANG.

25. Rai Sahib Mohidhar Bhuyan, Mauzadar, Haleswar, Post Office, Tezpur.

SIBSAGAR.

26. Srijut Deveswar Sarma Barthakur, Thakurbari Farm, Post Office, Haloguri.
27. „ Deveswar Gossain, Barpathar Sugarcane Farm, Post Office Badlipar (Golaghat).
28. Rai Sahib Narayan Chandra Barua, Lahing, Nakachari Post Office.
29. Srijut Sarat Chandra Goswami, Superintendent, Normal School, Post Office, Jorhat.

LAKHIMPUR.

30. Srijut Pithambar Saikia, Mauzadar, Khowang, Post Office, Khowang.
31. „ Baikuntha Narayan Barua, Panitola Post Office.
32. Maulvi Zubaidali Hazarika, North Lakhimpur.

NAGA HILLS.

33. Dr. J. Riley Bailey, Mokokchang.

GARO HILLS.

34. Khan Sahib Abdul Latif Mauzadar of Mohendraganj, Mankachar Post Office.

RANCHI.

35. Rai Bhupal Chandra Basu Bahadur, B.A., M.R.A.C., M.R.A.S.

APPENDIX II.

Statement showing the receipts and expenditure of the Department of Agriculture for the year ending the 31st March 1920.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
(*a*) Sale of manure and farm produce.	21,588 1 0	(1) Superintendence ...	76,609 9 4
(*b*) Potatoes	597 7 0	(2) Agricultural instruction	2,031 2 9
(*c*) Other receipts ...	2,188 14 11	(3) Agricultural Chemist ...	18,032 7 3
(*d*) Receipts from Seed Depôts	32,022 10 10	(4) Experiment Stations ...	1,57,748 3 11
		(5) Agricultural Demonstrations and Experiments.	10,354 15 11
		(6) Seed depôts ...	43,290 1 3
Total receipts ...	56,397 1 9	Total expenditure ...	3,08,066 8 5

NOTE—The above figures are liable to revision as the Comptroller's figures for 1919-20 are not yet finally closed.

APPENDIX III.

Glossary.

Aus	Autumn rice.
Sail or Sali	Transplanted winter rice.
Dhaincha	Sesbania Aculeata.
Raishan	Paspalum Sanguinak.
Boro	Spring rice
Cowpea	Vigna Catiang.
Kachu	Colocasia antiquorum,

A. S. P. O. (R. & Agri.) No. 6—400—15-7-1920—O. M. R.

Resolution on the Report of the Agriculture Department in Assam.

Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 2419R., dated Shillong, the 26 July 1920.

READ—

The Report of the Department of Agriculture, Assam, for the year ending the 31st March 1920.

RESOLUTION.

ONE of the most urgent needs of the Agricultural Department in this province is the provision of an adequate staff of properly trained officers, and the Chief Commissioner, therefore, is glad to be able to announce that the Secretary of State has sanctioned the addition of an Economic Botanist and of a third Deputy Director of Agriculture to the staff, and that steps are being taken to secure recruits for these posts from England. The Secretary of State has also sanctioned revised rates of pay for the Indian Agricultural Service and the Provincial Agricultural Service with effect from the 1st December 1919. Mr. Birt's absence on leave owing to ill-health from the end of June 1919 has been a serious loss to the department and the province, and the Chief Commissioner trusts that a complete restoration to health will enable him to return to his post. Mr. McKay, the second Deputy Director, resigned the Indian Agricultural Service. The Chief Commissioner notes with pleasure the good work done by the two Indian officers who officiated in the vacancies. The success of all four Assam students in the final examination of the Sabour College is satisfactory, and has enabled the Chief Commissioner, since the close of the year, to complete the scheme for the employment of Agricultural Inspectors which was drawn up in 1914.

2. The crops to which the Department pays special attention at its experimental stations are sugarcane, potatoes and rice. The sugarcane experiments were continued at the Jorhat Farm, and much work has been done in selecting and establishing good varieties. The better kinds of cane are highly appreciated and a large number of setts were distributed during the year. The experiments made at this Farm in the application of lime were particularly interesting and are likely to be most valuable. The most important experiment in progress was the growing of sugarcane and manufacture of white sugar on a commercial scale at the Kamrup Farm. Here the planting season was very unfavourable owing to the long continued and unusual drought, and the crop was seriously damaged by an epidemic of beetles. In October 1918 the agreement with Mr. Maxwell was renewed for a term lasting till March 1924, but in March 1919 Mr. Maxwell transferred his rights and obligations under the agreement to Messrs. Bird & Co., as Managing Agents for the Assam Sugar Estates and Factories. Messrs. Bird & Co, offered to take over the farm itself on payment to them of Rs. 60,000, partly in cash and partly in standing crop, by the Local Administration. The maintenance of the farm was always a heavy tax on the small resources of the province and the nett loss to the Administration, if the farm were retained until the end of 1924, was likely to be at least Rs. 2,00,000. In these circumstances, and in view of the fact that unofficial opinion in the Provincial Legislative Council was unfavourable to the retention of the farm, the Chief Commissioner decided to close with the firm's offer, and the farm was handed over to the Company with effect from the 1st April 1920.

Rice is the speciality of the Karimganj Farm and the rice selection work was satisfactorily continued. The value of the work done at the Upper Shillong Farm in connection with potatoes has long been realized, and is emphasized by the great demand which prevails in both the hills and plains districts for seed potatoes from the farm. The fruit experimental station at Shillong also continued to make satisfactory progress, 23 acres having now been planted out with promising results.

3. Mr. Meggitt, the Agricultural Chemist, was again, owing to Mr. Birt's absence, hampered to some extent by the charge of the Kamrup and Jorhat Farms; but extensive work was carried out by him, principally in connection with the chemical

control of the sugar cane work and with experiments with regard to the influence of carbonate of lime on soil by biochemical processes. Useful work was done by the Entomological Assistant in connection with insect pests, and the removal of his head-quarters from Gauhati to Jorhat is reported to have proved a great advantage. The Chief Commissioner's thanks are due to Mr. A. C. Tunstall, Mycologist of the Indian Tea Association, for assistance in dealing with an outbreak of potato blight.

4. The demonstration work undertaken during the year dealt for the most part with the value of manures and with the qualities of different varieties of sugar cane, rice, jute and potatoes. Mr. McSwiney's account of these demonstrations is interesting, and his careful and sensible inspections of the work should be of great value to the new Deputy Directors in supervising this important branch of their duties. The extent of the transactions of the seed depôts shows that these demonstrations have a substantial effect in awakening the interest of the cultivator. The Chief Commissioner hopes that the Director's appeal to non-official gentlemen to extend the movement by growing pure lines of seed for distribution will meet with response. Attempts were continued to extend terraced rice cultivation in the Naga Hills, Lushai Hills and Sadiya Frontier Tract, but met with indifferent success outside the Naga Hills.

5. The experiments commenced in 1917-18 in the use of the ash of the water hyacinth as a manure, with the object of converting this pest to useful purposes, were continued, and grants were made to Local Boards in Sylhet in order that they might take part in the work. An experimental installation was also erected for the extraction of potash salt from the ash. It appears that the potash content of the ash, when produced on anything but the smallest scale, is too low to admit of its economical use as manure except in the neighbourhood where it is produced. The only quotation received for the potash salt extracted gave a return of barely one-fifth of the cost of extraction. Mr. McSwiney's recommendation, based on these results, that the activities of the Agricultural Department in connection with the pest should be confined to demonstrating the use of the ash as manure in neighbourhoods where the plant abounds, is still under consideration. The Chief Commissioner has all along realised that the production of hyacinth ash and hyacinth salt must involve a financial loss and that the production could be continued only by means of a subsidy from Government. The question which is being examined is whether the ultimate results of the operation would justify this heavy recurring expenditure.

6. There was a largely increased sale of seeds, manures and implements from the two seed depots at Gauhati and Sylhet. When allowance is made for material supplied to farms and honorary correspondents and for demonstrations, these institutions are practically self-supporting, and the considerable expansion of their transactions is most satisfactory.

7. The Upper Shillong herd of Patna and cross-breed cattle was continued and numbered 98 head at the close of the year. The attention of Local Boards was invited to the resolution which was issued in October 1918, defining the policy of the Local Administration on the subject of improving the existing breeds of cattle in Assam, but hitherto the Boards' response to the Chief Commissioner's invitation to co-operate in this important but difficult matter has not been encouraging.

8. The Chief Commissioner has read with interest the list of honorary correspondents and congratulates them on the valuable work which they are doing in connection with the improvement and development of the agriculture of the province. His thanks are due to Mr. McSwiney for the able manner in which he has continued to manage the department, and for a most interesting report; also to the officers of the department whose good work has been mentioned by Director.

ORDERED that a copy of this Resolution and of the report be published in the Gazette for general information.

By order of the Chief Commissioner of Assam,

A. W. BOTHAM,

Chief Secretary to the Chief Commissioner of Assam.

A. S. P. O. (R. & Agri.) No. 6—100—27-7-1920—O. M. R.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending 31st March 1921.

132906

SHILLONG:
PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1921.

Price 1s.] [*Price* 8 *Annas.*

Agents for the sale of Books published by the Assam Administration.

Agents in India.

(1) Messrs. Thacker, Spink & Co., Calcutta.

(2) Messrs. W. Newman & Co., Calcutta.

(3) Messrs. S. K. Lahiri & Co., Calcutta.

(4) Messrs. A. M. and J. Ferguson, Ceylon.

(5) Messrs. R. Cambray & Co., 6 and 8/2, Hastings Street, Calcutta.

(6) Messrs. Thompson & Co., Madras.

(7) Babu Hari Ram Dhar, B.A., Popular Library, Dacca.

(8) Messrs. D. B. Taraporevala Sons & Co., 103 Meadon Street Fort, Post B ox No. 187. Bombay.

(9) The Indian School Supply Depôt, 309, Bow Bazar Street, Calcutta.

(10) Messrs. Rai M. C. Sarkar Bahadur & Sons, 90-2A, Harison Road, Calcutta.

(11) Messrs. Students & Co., Cooch Bihar.

(12) Messrs. Vas & Co., Madras.

(13) The Standard Literature Co. Limited, 23-1, Old Court House Street, Calcutta,

(14) The Standard Book Stall, Karachi.

(15) Mr. Mangaldas Harkisandas, Surat.

16) Messrs. Rarsandas, Narandas & Sons of Surat.

(17) Munshi Seeta Ram, Managing Proprietor, Indian Army Book Depôt Juhi, Cownpore.

(18) Proprietor, New Kitabkhana, Poona.

(19) The Association Press, Calcutta.

Agents in Great Britain.

(1) Messrs. Constable & Co., 10, Orange Street, Leicester Square, W. C.

(2) Messrs. Kegan Paul, Trench, Trübner & Co., 68—74, Carter Lane, E. C., London, Oriental Department, 25, Museum Street, London, W. C.

(3) Mr. B. Quaritch, 11, Grafton Street, New Bond Street, W.

(4) Messrs. P. S. King & Son, 9, Bridge Street, Westminster, S. W., London.

(5) Mr B .H. Blackwell, 50 and 51, Broad Street, Oxford.

(6) Messrs. Deighton Bell & Co., Limited, Cambridge.

(7) Messrs. Henry S. King & Co., 65, Cornhill, E. C., London.

(8) Messrs. Grindlay & Co., 54, Parliament Street, S. W., London.

(9) Messrs. W. Thacker & Co., 2, Creed Lane, London, E. C.

(10) Messrs. Luzac & Co., 46, Great Russell Street, London, W. C.

(11) Mr. J. Fisher Unwin, Limited 1 Adelphie Terrace, London, W. C.

(12) Messrs. Weldon and Wesley Limited, 28, Essex Street, London, W. C.

(13) Messrs. Oliver and Boyd, Tweedale Court, Edinburgh.

(14) Messrs. E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

Agents on the Continent of Europe.

(1) M. Earnest Leroux, 28, Rue Bonaparte, Paris.

(2) Martinus Nijhoff, The Hague.

SHILLONG:

PRINTED BY H. H. KING, SUPERINTENDENT, ASSAM SECRETARIAT PRESS.

[Prescribed maximum length—12 pages.]

CONTENTS.

CHAPTER I.

ADMINISTRATION.

	Paras.
Director and expert Staff	1
Provincial establishment	2
Subordinate establishment	3
Departmental buildings	4
Expenditure and receipts	5

CHAPTER II.

AGRICULTURAL EDUCATION.

General	6
Apprentices on Government farms	7
Sabour Agricultural College	8

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I—Agriculture.

Experiment Stations	9
Soil investigations	10
Sugarcane	11
Rice	12
Potatoes	13
Jute	14
Tobacco	15
Pulses	16
Green manure crops	17
Fodder crops	18
Fruit	19
SECTION II—AGRICULTURAL CHEMISTRY	20
SECTION III—ENTOMOLOGY	21
SECTION IV—MYCOLOGY	22
SECTION V—BOTANY	23

CHAPTER IV.

DEMONSTRATION.

Localities	24
Rice	25
Potatoes	26
Sugarcane	27
Jute	28
Water Hyacinth	29
Terrace cultivation	30
Fruit	31
Pulses	32
Demonstrations by Honorary correspondents	33

CHAPTER V.

SUPPLIES OF SEEDS, MANURES AND IMPLEMENTS.

Gauhati Seed Depôt 34
Sylhet Seed Depôt 35
General 36

CHAPTER VI.

Cattle breeding 37

CHAPTER VII.

MISCELLANEOUS.

Agricultural publication, etc. 38
Conference and meeting 39
General progress 40
Notice of services 41

APPENDIX.

List of Honorary correspondents I
Statement of receipts and expenditure II
Glossary III

No. IXA-1—445.

FROM

J. McSWINEY, Esq., I.C.S.,

DIRECTOR OF LAND RECORDS AND AGRICULTURE, ASSAM,

To

THE CHIEF SECRETARY TO THE GOVERNMENT OF ASSAM.

Shillong, the 15th June 1921.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 31st March 1921.

I have the honour to be,

SIR,

Your most obedient Servant,

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending 31st March 1921.

CHAPTER I.

ADMINISTRATION.

Director and expert staff.

I was in charge of the Department throughout the year and spent 150 days on tour. I inspected all the farms and seed depôts at least twice and demonstrations in Goalpara, Kamrup, Nowgong, Sibsagar, Cachar, Sylhet and Khasi and Jaintia Hills. Under the presidency of the Deputy Commissioner I gave informal lectures at Sylhet, Nowgong and Jorhat, explaining the work of the Department, which were followed by discussions.

Mr. Meggitt was Agricultural Chemist and held charge of Jorhat farm until 4th May 1920, when he took leave up to 4th March 1921. Mr. Birt, Deputy Director, returned from leave on the 12th January 1921 and resumed charge of the Assam Valley. During his absence Srijut Lakheswar Barthakur, Superintendent of Agriculture, continued to officiate as Deputy Director and was in charge of the Jorhat farm and the office of the Agricultural Chemist during the latter's absence. Mr. J. N. Chakravarty acted as Deputy Director of the Surma Valley and Hill Districts throughout the year; he was substantively appointed to the Indian Agricultural Service with effect from 1st December 1920. Mr. S. K. Mitra was appointed Economic Botanist by the Secretary of State and took charge of his duties on the 7th March last: his headquarters are located temporarily at the Karimganj farm pending the completion of his office, laboratory and residence near Jorhat.

During the short time he was in charge Mr. Birt spent 38 days on tour in Goalpara, Kamrup, Nowgong, Darrang and Sibsagar districts. Srijut Lakheswar Barthakur as officiating Deputy Director toured for 171 days and visited all the districts within his charge except Garo Hills; he visited Calcutta in connection with the supply of sugarcane mills. Mr. J. N. Chakravarty was on tour for 248 days. He visited Rangpur to see the cattle farm there and went to Dacca to attend the Social Service Exhibition and consult the Economic Botanist, Bengal, regarding rice breeding work at the Karimganj farm. He inspected all his demonstration centres and Upper Shillong and Karimganj farms.

Provincial establishment.

2. Maulvi Fazlul Huq Ahmed continued to be the Superintendent of Agriculture, Surma Valley, and Babu Satyendra Chandra Dutta, Agricultural Inspector, acted as Superintendent of Agriculture, Assam Valley, till 11th January 1921, when he was relieved by the permanent Superintendent, Srijut Lakheswar Barthakur. Their time was mainly devoted to managing the seed depôts, organising and supervising demonstrations and visiting the Honorary Correspondents of the Department. In the Surma Valley the Superintendent was on tour for 189 days and visited Comila in connection with the purchase of onion seeds. In the Assam Valley Babu Satyendra Chandra Dutta was on tour for 174 days, visiting all the districts in his charge and also Sylhet and the Karimganj farm. On his reversion as Inspector he was in direct charge of Goalpara district during the absence of the permanent Inspector and supervised the work of the Inspectors at Kamrup, Nowgong and Tezpur. He has been appointed permanent Superintendent of Lower Assam from 1st April with headquarters at Gauhati. Srijut Lakheswar Barthakur was on tour for 55 days and was mainly occupied in seed depôt work during the short time he worked as Superintendent.

Mr. Holder was in charge of the Shillong Fruit Station. The farms at Jorhat, Karimganj and Upper Shillong continued to be in charge of the three former managers and the Entomological Assistant remained unchanged. The post of Fruit Inspector is still vacant. During the year the total number of Agricultural Inspectors rose from nine to thirteen by the appointment of two probationers in each Valley, and the Agricultural Assistant continued at Sadiya. At the close of the year there was an Inspector at each district headquarters in the Assam Valley, in Cachar and Khasi and Jaintia Hills and in each subdivision of Sylhet except Sunamganj, where an Inspector under training will be posted very shortly. For convenience Sibsagar subdivision was placed under the Inspector at Dibrugarh and North Lakhimpur under the Inspector at Jorhat. In the near future there should be one more Inspector for Kamrup district and Mangaldai subdivision, which are akin agriculturally: Tezpur subdivision will be enough for one man.

Subordinate establishment.

3. During the year 40 Demonstrators were employed, of whom 16 were attached to the Assam Valley plains, 12 to Surma Valley plains, 1 to Garo Hills, 4 to Khasi and Jaintia Hills, 1 to the North Cachar Hills and 2 each in Lushai Hills and Naga Hills and Sadiya Frontier Tract. The Demonstrators in the plains districts are distributed as below:—

Cachar	2	Goalpara	3
North Sylhet	2	Kamrup	3
South Sylhet	3	Nowgong	3
Habiganj	3	Sibsagar	4
Karimganj	2	Lakhimpur	2
		Darrang	1

One temporary demonstrator from Rangpur was entertained in the Surma Valley specially for tobacco.

Departmental buildings.

4. The construction of residences for the Agricultural Chemist, Deputy Director, and Economic Botanist is now nearing completion. The extension of the existing laboratory for Botanical and Entomological work will soon be finished and the provision of fittings of the Botanical section will be taken up this year. There still remains the construction of quarters for the agricultural staff at Jorhat, detailed plans and estimates for which have already been passed: out of these the quarters for three technical assistants, four clerks and 11 menials are urgently required: I have asked for a provision of Rs. 36,000 in the current year to take up the work without delay.

Expenditure and receipts.

5. The expenditure of the Department was Rs. 2,39,840-2-2 and the receipts Rs. 76,183-10-5 against Rs. 3,08,066-8-5 and Rs. 56,397-1-9, respectively, in 1919-20. The financial heads of receipts and expenditure are shown in Appendix II. The large increase in receipts is due to the fact that the seed depôts at Sylhet and Gauhati realized Rs. 25,784 and Rs. 34,960 against Rs. 9,685 and Rs. 22,337, respectively, in the previous year. The increase under "other receipts" represents mainly a sum of Rs. 1,205 on account of sale proceeds of agricultural and vegetable produce in Sadiya Frontier Tract, Rs. 2,941 realized from the Assam Sugar Estates and Factories on account of stores of Kamrup farm and Rs. 2,500 credited on account of the price of an oil engine. The expenditure was less than the previous year on account of the disposal of the Kamrup farm since 1st April 1920. It is gratifying to note that the seed depôts at Sylhet and Gauhati with grants of Rs. 6,000 and Rs. 7,000 carried out transactions to the amount of Rs. 31,373 and Rs. 40,283, respectively, on account of the purchase of seeds, manures and implements by debiting the receipts against expenditure. The nett cost of the experiment stations at Jorhat, Karimganj and Upper Shillong was Rs. 10,337, Rs. 8,882 and Rs. 12,200, respectively.

CHAPTER II.

AGRICULTURAL EDUCATION.

General.

6. The heading of this chapter tends to confuse those of the public who think that improvement in agriculture results only or mainly from school or college education. Agricultural education in the sense of educating agriculturists is described in Chapter IV under the

head "demonstration" and this is the main function of our department to which everything else, establishment, research and experiments, leads. We are dealing with a population, of which over 86 per cent. are dependent on agriculture and are mostly illiterate: our object is to increase their incomes: it is clear that with such a large and illiterate population education must be by ocular demonstration on their own fields in their own villages. An account of what is done in this way will be found in paragraphs 24-33 below. Here my remarks are confined to the training of our demonstrators on the farms and of our Inspectors at College.

The question of following the example of other provinces in making experiments in teaching agricultural subjects to boys in schools was postponed by the late Government pending the achievement of some results in Bengal. I think that this decision was wise. It is clear from the last reports of the Central Provinces, Bombay and Bengal that the type of school likely to achieve results commensurate with the expenditure is at least very much in the experimental stage. In Bengal it has been decided to abandon the type which had been adopted for teaching boys intended to return to their land and I understand that Government is inclined to add agricultural classes to primary schools. Without entering into controversial points I think that the educated public in Assam will agree generally that primary school teachers in Assam are not equipped with the knowledge necessary to impart any theoretical information or practical training in agriculture, while there is no dispute that the appointment of teachers with agricultural training will be very expensive. Personally I believe that the popular demand for agricultural school education comes entirely from the non-agricultural classes, who naturally are anxious to provide some other end to their sons' school education than a legal, clerical or tutorial career. This anxiety is reasonable and commendable, but my personal opinion is that it is extremely doubtful whether the end in view will be attained by the means suggested. Assuming that it is possible to impart an agricultural training to boys in a school, the sons of non-agriculturists must be provided with land, cattle and implements before they can make a living from agriculture. Even in the still waste areas of this province this will imply capital to purchase cattle and implements and for support until the crops are reaped: it will also imply a hard life in uncongenial surroundings, away from urban amenities: in the more settled areas land must be purchased. On the other hand the sons of agriculturists must be kept in their homes so that they may not be allured by the attractions of town life and may learn from their fathers as they grow up: hence agricultural school education must be imparted in every village school, which means a very large expenditure of money. With our limited resources it is a question for consideration whether infinitely better results could not be obtained at a cheaper rate from improving agriculture by demonstration in the villages to the father of the family and through him to his sons. At any rate it seems to me uneconomical to spend money making experiments when other provinces are doing this for us.

Apprentices on Government farms.

7. The training of apprentices to be employed as Demonstrators lasts two years. In order to make it more complete the apprentices now get systematic instruction in elementary facts connected with agriculture from the Assistant Farm Manager, and simple training in insect pests and their control from the Entomological Assistant. The instruction given is as practical as possible, and deals principally with the operations actually carried out in the field by the apprentices during the day. At the close of the year there were eight apprentices each at the Karimganj and Jorhat farms, while the Upper Shillong farm had two. The second Lushai Demonstrator completed his six months' training at the Upper Shillong farm and a Lushai apprentice was deputed at the end of the year for similar training.

Sabour Agricultural College.

8. Higher training continues to be given at the Bihar College at Sabour, where scholarships of Rs. 20 per month are tenable by inhabitants of this Province. Candidates for employment in the Department are first tested and trained on a farm for a year, during which time they receive Rs. 15 per month. One Muhammadan and one Khasi apprentice were granted scholarships during the year under report, but failed in the first year class examination. One Muhammadan was selected for training at the Karimganj farm and has since been sent to Sabour with a scholarship. In view of the unsatisfactory results of our scholars even after a year's training on the farm, it has been decided that greater stress should be given in future to educational qualifications in selecting candidates for agricultural scholarships.

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—AGRICULTURE.

Experiment Stations.

9. There were four experiment stations during the year, the Kamrup farm for sugarcane cultivation having been handed over from 1st April 1920 to the Assam Sugar Estates and Factories, Limited. The farms at Jorhat, Karimganj and Upper Shillong are mainly devoted to experiments with sugarcane, rice and potatoes, respectively, while that in Shillong is the fruit experiment station. The Assam Legislative Council having decided to close the latter station, steps are being taken to dispose of it. The Local Government have sanctioned the establishment of a rice experiment station in the Assam Valley and approved the site selected near Titabor; its materialisation depends on the grant of money by the Council.

Soil investigations.

10. The experiments at Jorhat were continued during the year under report. The original liming experiment laid down in 1909 in Block G, in which half the area was given 50 maunds slaked lime per acre, is still showing the effects of the lime on the cropping; the non-limed area being incapable of bearing a crop, while the limed area produced a small crop even after the lapse of 12 years since the application of lime. The effect of the lime is however diminishing year by year, and the previous sour soil conditions are gradually being re-established. The liming and manurial experiment commenced on Block C in 1911, with the main object of testing the effect of large initial dressings of lime against the application of smaller dressings spread over a term of years, was continued in its tenth year. Since 1917 no further lime dressings have been given, but the plots have been cropped uniformly in order to observe the residual effect. This year the plots were fallowed during the rains and Para Pea (a small variety of cowpea) was sown as the *rabi* crop, but owing to bad weather conditions immediately after sowing and to a bad attack of crickets later on, the crop was extremely patchy and of no value for experimental record. Previous results obtained showed on the whole that during the first few years of the experiment the larger and less frequent lime applications returned the biggest crops, but that after about the fifth year the smaller and more frequent dressings began to give the better result. The crop on the wood ashes experiment on the same block shared the fate of that on the liming experiment; so no results are available this year, but previous results go to prove that wood ashes, especially in the case of the heavier dressings, have a very marked effect on this sour soil, although very much less than that of lime. In the experiment with ground limestone on Block L the non-limed plots as usual produced no crops. All the plots treated with limestone carried fair crops of green *jowar* followed by oats, the heavier dressings of limestone producing the heavier crops. This year for the first time the deeper cultivated sections showed to advantage over the shallow cultivated sections, and this viewed in connection with the second application of limestone given in 1919 indicates that, in the presence of larger quantities of lime, deep cultivation is beginning to have its effect on the cropping. The experiments on Block K conducted by the Agricultural Chemist, with the object of studying the functions of lime on this soil and the effect of various artificial fertilisers used with and without lime, continue to prove the value of basic manures, and the beneficial effect of phosphoric acid more particularly in its basic forms, while the toxic effect of acid manures such as Sulphate of Ammonia used in the absence of lime is clearly demonstrated. The experiments with mineral phosphates in the sugarcane rotation hitherto have been inconclusive with regard to the cane crop, but the effect of the phosphate is very positive in the case of rape and well marked on the oats and green manure crops.

Sugarcane.

11. The work at Jorhat, which includes the testing and selection of varieties (local and exotic) under chemical control, manurial and other experiments in the cane rotation and the distribution of suitable varieties, was continued. The varieties found suitable for distribution so far are Striped Mauritius B147, B376 and J33a. The young crop

planted early in March 1920 germinated well and made good subsequent growth, the analytical figures obtained showing that it ripened off well. The ratoon crop was not analysed this year owing to the absence on leave of the Agricultural Chemist, but records were kept of the weights of cane, juice and *gur*, from each variety. The 10 varieties ratooned gave an average crop of over 23 tons stripped cane per acre, the highest yield being from J33a with an average crop of 35·4 tons per acre, while Striped Mauritius, Barbadoes A, B3412 and J33a together averaged 34 tons of cane per acre. The heaviest outturn of *gur* was, however, 3·04 tons per acre from Striped Mauritius, and this was followed by Barbadoes A, B3412 and J33a with yields of close on 3 tons. The standard local variety Magh did very badly this year, and in fact much worse than usual. Twenty varieties of plant cane were grown, including a number of new varieties brought into the regular scheme of experiments for the first time. One of these, Co.6, became very badly infected with disease and had to be destroyed. The remaining 19 varieties came to maturity and were analysed by the Agricultural Chemist. The average yield for the 19 varieties was 33 tons cane per acre on the phosphated area and 31·9 tons per acre on the non-phosphated area. The older varieties kept up their reputation, Striped Mauritius yielding 38·4 tons of cane per acre, B376 32·8 tons and B147 29·7 tons. The highest yield was 42·4 tons from B3412, while J33a gave 38 tons as against 25·5 tons per acre from the local variety Magh. Of the new varieties the most promising were Co.9 and D74, the former yielding 37 tons per acre of very high quality cane and the latter over 39 tons. The new Java varieties gave a fairly good account of themselves; they are hard and erect and, with the exception of J247, rather thin canes. Of the new Mauritius canes M55 and M131 are the most promising. The highest yield of sucrose per acre was given by Co.9 with an average of 10,024 lbs. per acre, followed by B3412 with 8,684 lbs., Striped Mauritius with 8,455 lbs., D74 with 8,400 lbs., B6450 with 7,983 lbs., B147 with 7,693 lbs., J33a with 7,568 lbs., J247 with 7,440 lbs., B376 with 7,185 lbs., J213 with 6,758 lbs., J139 with 5,842 lbs., J36 with 5,737 lbs., and lastly the local variety Magh with only 3,783 lbs. With regard to quality of juice Co.9, B6450, A21 and B147 came out best. D74, B3412 and J33a, although very heavy croppers, were far behind the above-mentioned varieties in quality and purity of juice. Of nine new varieties planted in the nursery during the year, one variety, D95, was a complete failure and had to be destroyed. The remainder are being propagated for further trials.

Rice.

12. Rice selection work continued for the seventh year at Karimganj farm Single pure line selections from 59 varieties of early broad cast *aus* and 193 varieties of *sail* were grown for comparison. Similar work has also been taken up with transplanted *aus* and with *asra*, a shallow *aman* paddy: 6 and 49 pure types, respectively, of these two varieties have been isolated. As a result of the tests for the last three years the Department is now in a position to recommend an *aus* variety, M-$\frac{16}{30}$, to the cultivators. This has been already tried on a few cultivators' plots round the farm and on an average has given an increase of 450 pounds per acre over the local varieties. The comparative experiments will be continued with the 5 most promising *aus* varieties. The experiments with the *sail* varieties have definitely established the superiority of *Indra sail*, *George sail* and *Lati sail* over the local varieties. On comparatively high land *Lati sail*, which is a farm selection, is more suitable than the other two varieties. This variety will now be given out for demonstration. Comparative tests will be conducted of 5 varieties with *Lati sail* as the standard. *Sayamara* and *Dholmegh* have been discarded from this test as being inferior.

Potatoes.

13. The acclimatizing, testing and distribution of potato seeds continue to be the principal work of the Upper Shillong Farm. Altogether 26 varieties were under trial. King of Potatoes, British Queen, Up-to-date and Imperator continue to give the heaviest yields. Magnum Bonum and Windsor Castle appear to be deteriorating. Of the three varieties obtained in 1918 "Arran Chief" has given good results: the other two are not promising. There has been an outbreak of potato disease in the Khasi Hills since 1919: to avoid the risk of spreading the disease through seeds, 4,600 pounds of fresh tubers have been obtained from Messrs. Sutton and Sons and planted on the farm. The sprouted summer seed is giving as good outturns as winter seed. The manurial experiments have not yielded any definite results, but will be continued. The demand for our selected seeds from the hills and the plains districts as well as from outside the province is increasing very rapidly. In order to meet this demand, as far as possible, pure seeds are distributed from the farm to Khasi cultivators who undertake to grow them in separate plots and return one and a half

times' the seeds advanced: they also undertake to sell the whole of the produce to us: *10·8 tons were issued to Khasi cultivators during the year under this system.*

Jute.

14. The Bengal variety, Kakaya Bombai, continued to show its superiority over the local varieties. The average of the last six years shows an increase of 401 pounds per acre. The manurial tests have not given any definite results except to indicate that Water Hyacinth ash is likely to prove a profitable manure. Experiments with this will be continued.

Tobacco.

15. Experiments are being conducted at the Karimganj farm, as well as in a few centres in Sylhet district, to see whether the superior varieties of Rangpur can be successfully grown in the Surma Valley. A trained man has been brought from Rangpur and so far the experiments appear to be promising. The tobacco has been harvested and is being cured. In Lushai Hills imported varieties of tobacco were grown at Lungleh and the results were satisfactory: a trial in this crop was made also at the Dhubinalla garden and it grew fairly well. These experiments will be continued.

Pulses.

16. At Jorhat Burma Bean, Para Pea and four varieties of Rahar were grown. Para Pea was practically a failure this year owing to the attacks of crickets: Burma Bean produced 9 maunds of seed per acre. The heaviest yield of Rahar was from a variety which, however, appears to be too late in ripening to be suited to the conditions in Upper Assam. Of the four varieties tried " Comilla White " would appear to be the best.

Green Manure Crops.

17. Experiments at Jorhat have proved conclusively that for our purposes dhaincha and cowpea are the best green manure crops, and both are now used regularly in the rotation with excellent results. The variety of cowpea " Jorhat Brown " selected some years ago at Jorhat gives a large crop of green stuff which decomposes very readily in the soil. If sown thinly in the latter half of August, it produces a good crop of seed also. Experiments with other green manure crops have now been discontinued in view of the excellent results obtained with the above crops.

Fodder Crops.

18. Experiments with Guinea grass and Rhodes grass were continued at Jorhat. From the small plots 10 cuttings were obtained in the year, the yield from Guinea grass being at the rate of 37·6 tons of green fodder per acre and that of Rhodes grass 20·4 tons. On a plot measuring about ¼ acre, where the crop did not get so much attention, Guinea grass gave 8 cuttings totalling 16·3 tons of green fodder per acre. Guinea grass is more readily established than Rhodes grass and does not require so much care: hence it appears to be more suitable for introduction under ordinary conditions. The Sudan grass from Australia put down last year is not at all promising in comparison with the other two grasses. At Upper Shillong farm maize is grown for silage and *raishan* for hay, both of which make excellent fodder. The attempts at growing fodder crops in the Surma Valley have not so far been successful, and with the extensive area of grass still existing in the Assam Valley, it will take years for the cultivation of fodder crops to become popular.

Fruit.

19. The experiments in fruit continued in the station at Shillong: Rs. 792 worth of fruits was sold during the year. As stated in paragraph 9, steps are being taken to close this station.

Section II.—Agricultural Chemistry.

20. Owing to his absence on leave for the greater part of the year very little work was done by the Agricultural Chemist. His Laboratory Assistant appointed in 1919 was sent to the Agricultural College, Sabour, for post-graduate training in May, 1920, but took employment under the Assam Sugar Estates and Factories Limited in September. The chemical work in connection with the control of the experimental sugarcane work at Jorhat continued, some thirteen new varieties being added. As noted above, some of these shew exceptional promise: further details will be found in the Jorhat farm report. As the laboratory was closed during the greater part of the year the number of samples received for analysis was small, comprising 9 soils, 2 manures and 8 samples of rape seed, etc. The various field experiments in connection with this section were continued and details will be found in the Jorhat farm report.

Section III.—Entomology.

21. Babu Satya Ranjan Gupta held the post of Entomological Assistant throughout the year. He was on tour for 156 days. He visited some village fairs in the Surma Valley and a cultivators' meeting at Nalbari, where specimens of insects injurious to crops were exhibited, leaflets on insect pests distributed and methods of control explained.

A brief account of his work is given below :—

(1) *Paddy Pests.*—Rice Hispa (*Hispa Armigera*), rice bug (*Leptocorisa Varicornis*) and rice stem borer (*Schoenobius bipunctifer*) were reported from both valleys. Serious damage by the Rice Hispa occurred in an extensive area near Srimangal, while there was an unusually severe attack of Rice Grasshopper in the neighbourhood of Hajo. Army Worm Caterpillars appeared in Sibsagar and Kamrup districts, and Swarming Caterpillars in the Khasi Hills, where the use of ropes to dislodge the pest and the spreading of a thin film of kerosine oil on the water in the fields proved an effective remedy. A successful demonstration of the same method against Rice Case Worm was also carried out in the paddy fields near Sorbhog. A mealy bug (*Repusia Sacchari*) again made its appearance on the Karimganj farm, but it was checked from spreading by promptly weeding out affected plants.

(2) *Pests of pulse crops.*—A serious pest of *arhar* in the Assam Valley was a species of Apion, which destroys the flowers and pods. On the Jorhat farm crickets proved troublesome to soybean seedlings, but were kept in check by the use of the white ant exterminator. Bihar Hairy Caterpillers (*Diacrisia obliqua*) which attack various pulses were controlled on the farms by systematic hand-picking. Other pests included a chrysomelid beetle (*Pogria Signata*) which did some damage to the leaves of cowpeas.

(3) *Pests of Oilseed crops.*—The rape crop was again attacked by the Mustard Aphis and Sawfly. Against the latter pest dusting the crop with a mixture of sand and ash sprinkled with kerosine oil was tried successfully. In the castor crop the Castor Semilooper was controlled by systematic hand-picking.

(4) *Pests of Fibre crops.*—Bihar Hairy Caterpillar was again prevalent on the jute crop in both valleys. As a remedial measure the collection and destruction of egg masses and clusters of young caterpillars on the crop was recommended. Jute Semilooper was reported from Goalpara, Kamrup and Sylhet, where dragging ropes soaked in kerosine oil over the young crop was tried against the pest. Jute seedlings were reported as being attacked by crickets in Sylhet.

(5) *Pests of Sugarcane.*—Borers were of general occurrence, but the damage was not serious. Scale insects were found on the leaves of cane on the Jorhat farm.

(6) *Miscellaneous Pests.*—Cut worms (*Agrotis Ypsilon*) as usual were troublesome to vegetable seedlings and in fact to the young seedlings of all *rabi* crops, but particularly so in the case of potatoes and tobacco. In the Khasi Hills mealy bugs were found attacking fruit trees, and a spotted beetle was a pest on the Rhubarb crop, while Cantharid beetles were a source of damage to several crops, especially potatoes. Pests of seed and stored grain were dealt with on the Jorhat Farm by fumigation with carbon-bi-sulphide and in the Gauhati Seed Depôt with sulphur.

In the Laboratory a number of insects were reared and added to the collections and some were taken to Pusa for identification.

With regard to the training of the district staff in the identification of the more common insect pests and simple methods of control, a commencement was made this year on the Jorhat farm, where the apprentices now receive regular instruction from the Entomological Assistant when at headquarters, and similarly at the Karimganj farm when he goes there on tour. Instruction was given to Inspectors and Demon-

strators as far as possible when the Entomological Assistant was on tour in their respective circles. During the coming year it is proposed to make this training more systematic by arranging for the Entomological Assistant to visit each district or sub-divisional headquarters at a suitable time when Inspectors and Demonstrators will be called in to attend an Entomological class for a few days.

Section IV.—Mycology.

22. The potato disease *phythopthora infestans* appeared again on the crop at Kokilamukh in Sibsagar and spraying with Burgundy mixture was undertaken promptly by the district staff. By this means the disease was checked and prevented from doing serious damage.

A crop of Rahar at the Tezpur Lunatic Asylum was reported to be dying out: specimens sent to Pusa were found to be attacked by a "wilt" disease (*Fusarium udum Bute*). The crop was uprooted and burnt, and the Superintendent was advised not to sow again on the same land for some years.

There was an outbreak of disease in the Khasi Hills potatoes and the Imperial Agriculturist and the Imperial Bacteriologist visited Shillong in connection therewith. A leaflet in Khasi was distributed to growers advising them to reject diseased seed. As noted above 4,600 pounds of fresh seed potatoes have been obtained from Scotland through Messrs. Sutton & Sons and planted at the Upper Shillong farm to make a new start.

The Mycological Assistant from Pusa visited Karimganj and North Sylhet to study the betelnut disease, which has since been taken up by our Economic Botanist.

Section V.—Botany.

23. Mr. S. K. Mitra joined his post as Economic Botanist to this Government on 7th March with temporary headquarters at Karimganj farm. He was at Dacca for some days before his arrival to Karimganj with a view to discussing rice selection work with the Economic Botanist, Bengal. His laboratory at Jorhat is being constructed and its fittings will be taken up this year. He has now taken up the study of betelnut disease in Sylhet and fruit cultivation in the plains, in addition to the rice selection work in the Karimganj farm.

CHAPTER IV.

DEMONSTRATION.

24. During the year demonstrations on cultivators' holdings were carried out under the general supervision of the Deputy Directors in all the plains districts and in the Khasi and Jaintia, Garo and North Cachar Hills: in the Sadiya Frontier Tract the Agricultural Assistant works under the orders of the Political Officer and advice is given by the Deputy Director when required. The work in the Naga and Lushai Hills, which consists mainly in extending terrace cultivation, is not yet directly under this Department. During the year I made a detailed inspection of Agricultural Demonstrations in the Surma Valley and in Goalpara, Kamrup, Nowgong and Sibsagar in the Assam Valley.

Localities.

25. The residual effect in the third year of manures applied in 1918 was observed in a few centres in Sibsagar and Kamrup. In Sibsagar bonemeal gave an average increase of only 67 lbs. grain per acre in the third year as against 394 lbs. for flour phosphate, the total average increase for the three years being 659 lbs. for bonemeal and 1,395 lbs. for flour phosphate. In Kamrup *dhaincha* green manure gave an increase of 96 grain per acre against 358 lbs. for bonemeal *plus* green manure, the total average increase for the three years being 356 lbs. for *dhaincha* alone and 706 lbs. for bonemeal *plus dhaincha*. The residual effect in the second year of manures applied in 1919 was observed in Sibsagar, Kamrup and Goalpara. In Sibsagar bonemeal alone gave practically the same increase in the second year as when used with *dhaincha* for green manure, but over the two years bonemeal *plus dhaincha* gave a total increase of 713 lbs. grain per acre as against 315 lbs. for bonemeal alone. In Kamrup bonemeal *plus dhaincha* gave an increase of 650 lbs. in the second year, while the increase in the case of *dhaincha* alone was only 292 lbs., the total increase for the two years amounting to 1,054 lbs. for bonemeal *plus dhaincha* and 609 lbs. for *dhaincha* alone. The result of oilcake was disappointing, as the manured plots gave a slight decrease this year after an increase of 139 lbs. in the first year, but, as the non-manured plots gave an average yield of

Rice.

over 25 maunds of *sali* paddy per acre, the land was evidently of more than average fertility and should not have been chosen for a manurial demonstration. In Goalpara bonemeal gave an increase in the second year of 197 lbs. grain per acre and flour phosphate 273 lbs., the total increase for the two years being 472 lbs. for bonemeal and 521 lbs. for flour phosphate.

During the year under report a number of new manurial demonstrations were laid down in all districts except Darrang. Except in Sibsagar, where bonemeal used alone gave an average increase of nearly 500 lbs. grain per acre, the phosphatic manures have not given a sufficient return (at present prices of manures) to cover the cost of their application, but as their effect is usually spread over three years, this apparent loss should be turned into a substantial gain within the next two years. In Dibrugarh, Nowgong and Goalpara where bonemeal has been used in conjunction with *dhaincha* for green manure, the results are better, the green manure probably helping to bring the bonemeal more quickly into use. The effect of oilcake was seen best in Kamrup where it gave an average increase of over 500 lbs. of grain per acre.

With regard to rice manurial demonstrations generally in the Assam Valley the experience gained up to date varies enormously according to the locality and the conditions under which the demonstrations are carried out. On poor and exhausted land phosphatic manures will give a return spread over three years, but so far little demand from the cultivators has been created for these manures. Green manure and oilcake give a more immediate return, but in the case of the former it is difficult to persuade a cultivator to sow a crop, which has to be ploughed in for the benefit of the succeeding crop, and protect it against grazing animals. In the circumstances probably the most useful work in the near future will be to induce the cultivator to conserve the natural manurial resources round the homestead, *viz.*, cowdung, ashes, waste vegetable matter, etc., and apply them to his land regularly. In addition, green manuring and the sowing of a pulse crop (*e.g.*, *khesari*) on rice land should be encouraged wherever conditions are suitable. Phosphates will no doubt eventually find their place as manures, but for the present it would appear that their comparative high cost and the cultivator's lack of capital will prevent much development in this direction.

The demonstration and distribution of Mr. Hector's *Indra sali* and Rai Sahib Narayan Chandra Barua's *George sali* were continued during the year. In Goalpara the average increase over local paddy for *Indra sali* was 382 lbs. grain per acre as against 99 lbs. for *George sali*. In Kamrup the figure was 404 lbs. for *Indra sali* and 37 lbs. for *George sali*, and in Nowgong 215 lbs. for *Indra sali* and 139 lbs. for *George sali*. Results in Sibsagar district and Dibrugarh were very erratic and disappointing. In Sibsagar *Indra sali* gave negative results in 4 centres out of 7 and only a very small increase in the remaining 3 centres. *George sali* is apparently more suited to local conditions and is said to be popular with the cultivators, but it also gave negative results in 3 centres out of 6. In Dibrugarh subdivision *Indra sali* gave negative results in 3 out of 5 centres, but showed an increase of 272 lbs. per acre over the local varieties in one centre, while *George sali* gave an increase of 548 lbs. in one centre. In addition to the above varieties, *Nagra sali* gave an increase of 242 lbs. per acre in Goalpara and 214 lbs. in Nowgong.

The quantity of seed distributed in 10 lbs. packets for trial was 76 maunds of *Indra sali* and 28 maunds of *George sali*, and also small quantities of *Nagra sali*, *Kataktara aus* and *Boro* paddy: this should secure a crop of well over 4,000 maunds of good seed paddy.

At present the Assam Valley is dependent on Bengal and the Surma Valley for improved varieties of rice, and, until we establish at least one rice experiment station in this Valley, where selection work can be done under local condition, we must proceed with great caution with regard to the Bengal and Surma Valley varieties, introducing them only in such localities where experience has proved conditions to be favourable.

In the Surma Valley the use of bonemeal was restricted to poor soils with more successful results. During the first year its use has not generally been remunerative, but the results of two years have usually given a small profit. Bonemeal and *dhaincha* and bonemeal and oilcake have also not proved remunerative in the first year. But in the second year bonemeal and *dhaincha* have given a profit of Rs. 17 to Rs. 51 per acre. The results, however, are very fluctuating and appear to be highly susceptible to purely local conditions. *Dhaincha* has usually given very good results, but a successful stand could not be obtained last year on account of early rains. It will be necessary, however, to continue with manurial demonstrations as the increased

outturns from improved seeds are likely to draw more and more on the soil. Until, however, the price of bonemeal goes down to its former level, its use in the plains is hardly likely to be economical. Limestone and *dhaincha* have not been found economical. In the Khasi Hills the use of bonemeal, in spite of the high price, continued to be popular: its use was demonstrated on seven new centres and gave an average increase of 414 pounds per acre even in the first year: a few plots where the results were recorded for three years showed an average increase of 966 pounds per acre in three years. Thirty eight tons of bonemeal were sold in Jowai and Shillong during the year.

Increasing attention is being paid to extensive introduction of superior varieties of paddy in the Surma Valley. *Indra sail* and *George sail* have been found to be superior to local varieties in soils of medium level in all the subdivisions of Sylhet: 150 maunds of these two varieties were sold and distributed, which should yield over 6,000 maunds of good seed. *Indra sail* gave an average increase of 547 pounds in Habiganj, 431 pounds in Karimganj, 390 pounds in South Sylhet, and 352 pounds in North Sylhet. *George sail* gave an average increase of 643 pounds in Habiganj, 496 pounds in Karimganj, 282 pounds in South Sylhet and 217 pounds in North Sylhet. For Cachar neither of these two varieties were found suitable: and for this district *Lati sail*, a Karimganj farm selection, seems to be very promising: it gave an increased outturn of 612 pounds per acre in Cachar, 549 pounds in Karimganj and 377 pounds in North Sylhet. This variety promises to be particularly suitable for comparatively high land and will be tried next season on a large scale. An improved *aus* variety from the Karimganj farm, $M\frac{36}{30}$, was tried in a few places and gave an increased outturn over the local varieties. This, as well as *Kataktara* (Dacca farm selection), are being tested on a large scale during the present season.

Potatoes.

26. Demonstrations were carried out in the Surma Valley to test the Shillong potatoes against country varieties. The former gave an increased outturn of 1,046 pounds per acre in Sylhet and 1,492 pounds in Cachar; medium seed was compared with small seed and gave an increased outturn of 520 to 1,899 pounds per acre. Over 42 tons of seed potatoes of improved varieties were sold in the Surma Valley. They are rapidly gaining in popularity in the plains as will appear from the quantities supplied by us from the Khasi Hills during the last few years given below:—

1918	...	...	...	...	36 tons.
1919	...	...	...	...	62 „
1920	...	...	...	...	110 „

The superiority of the improved varieties were demonstrated in nine centres in the Khasi and Jaintia Hills.

In the Assam Valley demonstrations with Shillong seed showed average increases in favour of the Shillong varieties of 1,574 lbs. per acre in Dibrugarh, 414 lbs. in Tezpur, 1,005 lbs. in Nowgong and 679 lbs. in Kamrup. In Goalpara the crop, both of Shillong and "deshi" varieties, was poor except in three centres, in one of which the Shillong seed gave an increase of more than 6,000 lbs. per acre over the "deshi" seeds. In the previous year there were indications in certain centres in Kamrup that Darjeeling potatoes were superior in yield to the varieties from Shillong. In order to give this a further test, trials of Shillong *versus* Darjeeling potatoes were carried out in three centres in Kamrup and in two centres in Sibsagar during the year under report. In Kamrup the average increase in favour of the Darjeeling variety was 2,013 lbs. per acre, but in one centre the Shillong variety was superior to the Darjeeling variety, while in Sibsagar the increase in favour of the Darjeeling variety was 981 lbs. per acre in one centre and 375 lbs. in the other. The result on the whole is in favour of the Darjeeling variety, but further tests are necessary under more complete control before the matter can be settled. In order to test whether the superiority of the Darjeeling seed is due to variety or to Darjeeling being a better seed growing locality than Shillong, arrangements have been made to grow the Darjeeling variety for seed at Shillong and to test it in the plains against the Shillong varieties and also against seed direct from Darjeeling.

The demand for Shillong varieties is increasing in the Assam Valley, and, in addition to seed issued by the Department, cultivators are now purchasing seed of these varieties from the local bazars. During the year the amount of Shillong seed potatoes disposed of by the Seed Depôt, Gauhati, was 1,534 maunds, of which 145 maunds were used for demonstration purposes and the remainder sold to the public. Of this over 300 maunds were sold to potato cultivators at Kokilamukh (Sibsagar) and 230 maunds to cultivators in Nowgong district.

In the Lushai Hills potato cultivation continued as in the past both in Aijal and Lungleh subdivisions. The results, except in the Dhubinalla Government garden were very unsatisfactory on account of drought in May.

Sugarcane.

27. As the results of previous year's demonstrations in the Assam Valley, the demand for setts of the three superior varieties Striped Mauritius, B147 and B376 was so enormous that we were quite unable to cope with it. The supply of setts from the local centres proved to be much less than was anticipated, and a great deal of trouble was experienced in their collection and despatch. Altogether about 1½ lakhs of setts were distributed, of which over 80,000 were supplied from cane-growing centres in Sibsagar district, 40,000 setts from the Assam Sugar Estates, Kamrup, and 8,000 from the Jorhat farm. This, however, does not represent anything like the actual extension in cultivation of these varieties as every endeavour is made by the demonstration staff to induce cultivators already in possession of our cane to pass on setts to their neighbours, and this is being done to a large extent. The supply of setts direct from the Department can only be put on a satisfactory basis, when we have seed farms where cane setts for distribution can be grown directly under our own control, but in the meantime the best we can do is to continue the present system, and at the same time put applicants for setts in communication with cultivators who are known to be growing the superior varieties. Judging from the heavy demand for setts the necessity for further demonstration work with these varieties has largely disappeared in most localities, but a few were carried out in Nowgong and in Goalpara, where B147 gave an increase of 2,222 lbs. of *gur* per acre over the local varieties. In the Sadiya Frontier Tract over 8,000 setts were distributed to cultivators.

The 3-roller iron sugarcane mill is now firmly established in the Valley, and the demand during the year was much greater than the supply. The number of mills actually sold through the Seed Depôt in the Assam Valley was 258 and 4 were issued for demonstration purposes. Many orders had to be refused towards the end of the season on account of the insufficiency of the supply of mills from Calcutta. The sale of mills is now getting almost beyond the capacity of the Agricultural Department, and attempts are being made to induce local firms to take up the manufacture. Shallow *gur* boiling pans are not so popular with the cultivator as the 3-roller mills, but 58 were sold through the Seed Depôt, and 6 were used for demonstration purposes during the year.

Government control of Kamrup Sugarcane Experiment Station ceased with effect from 1st April 1920, when it was taken over by Messrs. Bird and Company, but the following information was kindly supplied by their Manager :—

Of the beetle infested "plant" cane crop of 1920 an area of 166 acres survived as ratoons, which were harvested in 1921, yielding a total of 572 tons of cane which works out at only 3·45 tons per acre. The total area of cane planted in 1920 was 315 acres, of which only 267 acres was actually harvested in 1921, the remainder having failed owing to defective germination. This gave a total outturn of 2,658 tons of cane, or 9 9 tons per acre reckoned on the actual area harvested. The average for the total crop is low, but Block 8 (60 acres) averaged 18 tons per acre, while 30 acres on Block 6 averaged 19 tons per acre. The remainder of the crop was very poor, owing largely to the excessive rainfall, which amounted to 135 inches against an average of 1,00·5 inches and which created difficulties in the drainage on many of the blocks. The comparatively good results on Blocks 6 and 8 are accounted for by more effective drainage and better soil conditions generally in these areas. The results of the manurial experiment laid down in 1920 on Block 4 are of little value this year owing to a scanty crop caused by waterlogging, but the Manager reports that there were indications of the value of "organic" manures as against "inorganic". The whole of the crop was milled this year between 2nd week of February and 1st week of April, only tops being used for planting.

In the Surma Valley the year was very favourable for sugarcane crop, but unfortunately the improved varieties were much damaged by jackals and stolen by thieves. They gave an increased outturn of 1,897 and 371 pounds per acre in Cachar and Sylhet, respectively, over local varieties. It was very difficult to obtain enough setts to supply the demand, but 20,700 were distributed during the year. The demand for 3-roller iron sugarcane mills is also increasing and 66 were sold.

The cultivation of sugarcane is extending near Aijal in Lushai Hills. The Kamrup farm variety obtained in 1919 is doing well. *Gur* is being made locally and two Lushais were supplied with crushing mills this year.

Jute.

28. In the Surma Valley *Kakaya Bombai* has become very popular in Habiganj subdivision and 140 maunds of seed were supplied mainly for sale and partly for distribution. The cultivation of jute has, in the present year, decreased mainly on account of its low price, which has afforded an opportunity to political agitators to discourage the crop.

In the Assam Valley demonstrations with *Kakaya Bombai* gave an average increase of 409 lbs. fibre per acre over the local varieties in Nowgong and 166 lbs. in Gaolpara. The demand for seed was disappointing, only about 4 maunds being sold

out of a supply of 50 maunds stocked for the purpose. The remainder was distributed in small packets to cultivators for trial, chiefly in Goalpara, Kamrup and Nowgong.

Water Hyacinth.

29. The efforts made to combat the Water Hyacinth pest were described in detail in the last report and Government has accepted my contention that our connection should be restricted to demonstrate its use as a manure on jute, *mukhi* (*Colocasia antiquorum*) and potato. With an application of 6 maunds per acre jute gave an increased outturn of 246 lbs., potatoes 614 lbs. and *mukhi* 2,372 lbs. As the ash can be made at little cost it can be extensively used where Water Hyacinth occurs. These demonstrations are being extended and experiments conducted at the Karimganj farm on different crops.

Terrace cultivation.

30. In the Sadiya Frontier Tract demonstrations were continued by two Angami Nagas under the Agricultural Instructor. Four acres of terrace cultivation gave an yield of 25½ maunds of paddy per acre, and at Rotung exceptionally good results are reported from 12¼ acres. On 1½ acres of new terracing at Denning the yield was 25 maunds of paddy per acre, but at Remindambong, where the water-supply was irregular, the yield was only 10 maunds per acre. In Naga Hills according to the report of the Deputy Commissioner terrace cultivation is increasing in popularity and the terraces are improving. Considerable extensions were carried out to the existing terraces in the Upper Diku and the Tizu Valley villages. The yield during the year was above normal. The Deputy Commissioner thinks that further extension of the system of cultivation is still very urgently required and with a more liberal Government grant much more improvement could be carried out. The Superintendent of Lushai Hills reports that the terrace cultivation started in various places in his district suffered again owing to drought in April and May and the people are unwilling to continue it, but they have all been warned not to abandon it: this method of taking the horse to the stream and forcing him to drink cannot be practised outside the very backward tracts and I am rather doubtful of its eventual efficacy even there.

Fruit.

31. The Agricultural Inspector, Khasi and Jaintia Hills, was in charge of the duties of the Fruit Inspector. Three new orchards have been started on Khasi cultivators' holdings. The six orchards started last year are doing well. A large number of orange seedlings and some grafts of various fruit trees were supplied on demand. Guava, lime, lichi, peach and orange trees at Sadiya and the orchards at Naga Hills are reported to be doing well. In the Lushai Hills there are now plenty of bearing orange trees and pine-apples all over the district: during the year 56,500 oranges were exported from Sairang to the plains.

Pulses.

32. In the Assam Valley demonstrations were made in a number of centres with *arhar* and Patna *keshari*, *mashuri* and *matikalai*. On the whole the results of *arhar* were not satisfactory, but good results were obtained from the other pulses especially in Nowgong, Kamrup and Goalpara, where the Patna varieties were much appreciated. In the Surma Valley 8·6 tons of pulse seeds were distributed and sold. On account of late rains, which retarded sowing, and the damage caused by insects during ripening period, the results were not satisfactory.

Demonstration by Honorary Correspondents.

33. There were 11 Honorary Correspondents in the Surma Valley, 20 in the Assam Valley, 3 in Khasi and Jaintia Hills and one in the Garo Hills. Mr. Ferguson experimented with improved paddy varieties and wheat, not with very satisfactory results, and brought our improved seeds to the notice of the cultivators round him. Rai Sahib Joy Nath Nandi gave, as usual, considerable assistance in the sale of potato and other *rabi* seeds at Bejura and also started an Agricultural Association: the success of the Bejura seed store was due very largely to the assistance rendered by him. Maulvi Abdul Waheb successfully tried improved varieties of paddy and sugarcane, started an Agricultural Association and rendered valuable assistance in selling our seeds. Maulvi Abdul Mannan Chaudhury obtained good results with *Lati sail*. Babus Rasik Chandra Nandi Mazumdar of Itakhola, and Jagatpati Bhattacharjee of Chatian, though not Honorary Correspondents, gave very material assistance in the sale of *rabi* seeds.

In the Assam Valley Mr. D. C. Chakravarti, Dewan of Gauripur Estate, took a great interest in the work of the Department and has arranged to let us have land on the estate for demonstration and seed growing purposes. Babu Lalit Mohan Dutta of Dhubri distributed a considerable quantity of jute seed. Through the influence of

Srijut Chandra Nath Sarma, Pandit, several sugarcane mills were sold in the neighbourhood of Palasbari. Srijut Pratap Narayan Chaudhury of Nalbari grew Shillong potatoes, obtaining an yield of 150 maunds per acre. In Nowgong Babu Jnan Chandra Ray got excellent results from 6 bighas of B147 sugarcane, and distributed setts to his neighbours; he also reports favourably on *George sali* paddy. Srijut Balaram Hazarika made successful demonstrations with Shillong potatoes, *Kakaya Bombai* jute and *George sali* paddy, and assisted in the distribution and sale of seed. Srijut Bhogadutta Hazarika distributed seed potatoes and vegetable seeds, and also made demonstrations. At Tezpur Rai Sahib Mohidhar Bhuyan, Mauzadar, grew *Kakaya Bombai* jute and *rahar* and is now providing land for growing jute and paddy seed and sugarcane setts for distribution. In Sibsagar Rai Sahib Narayan Chandra Barua supplied seed of his *George sali* paddy, and Srijut Deveswar Gossain of Badlipar again supplied Striped Mauritius sugarcane setts, and also made trials of several varieties of *rahar*. In Lakhimpur Srijut Pitambar Saikia, Mauzadar, Khowang, distributed sugarcane setts and *George* and *Indra sali* paddy seed.

CHAPTER V.

SUPPLIES OF SEEDS, MANURES AND IMPLEMENTS.

Gauhati Seed Depôt.

34. The total value of seeds, implements and manures issued during the year was Rs. 39,628. Of this 84½ tons of seeds and manures were valued at Rs. 14,446, 60 tons valued at Rs. 9,321 being actually sold and the remainder being issued for demonstration purposes and free distribution. The principal item was 56 tons of Shillong seed potatoes, of which over 50 tons to the value of Rs. 7,778 were actually sold to the public. In addition 8,724 small packets of cold weather vegetable seeds valued at Rs. 1,278 and sugarcane setts to the value of Rs. 1,429 were dealt with. The total value of implements issued amounted to Rs. 25,182, of which Rs. 24,410 were actual receipts by sales, the main item being 267 sugarcane mills actually sold for Rs. 22,510: four mills were issued free for demonstration purposes bringing the total number of mills supplied to 271. Altogether 55 different kinds of seeds, manures and implements were dealt with during the year. They included, in addition to the above-mentioned main items, *George* and *Indra sali* paddy seed, *dhaincha* (Rs. 635), jute, pulses, oats, bonemeal and *gur* boiling pans (Rs. 1,771). The total liabilities of the depôt for the year were Rs. 44,488 and the total assets Rs. 45,504, leaving a credit balance of Rs. 1,016 at the end of the year, after making allowance for all charges including rent, establishment, contingencies and depreciation on stock in hand. The value of the stock in hand at the close of the year, Rs. 5,577, was more than double that at the commencement and, as it consisted chiefly of implements which are not likely to depreciate in value, the 10 per cent. deduction on the total value of stock in hand is probably too high.

Sylhet Seed Depôt.

35. In the Sylhet Depôt seeds, manures and implements to the value of Rs. 31,927 were supplied during the year, of which Rs. 28,333 worth were issued to the public and rest to farms and for demonstration. The most important of the articles supplied were 53 tons of Shillong potatoes to the value of Rs. 7,225, 11 tons of pulses and oil seeds, 8·73 tons of paddy, 246 lbs. of *Kakaya Bombai* jute seed (Rs. 950), 48 tons of bonemeal valued at Rs. 7,756, 66 sugarcane mills (Rs. 5,652), 16 pans and 5 Meston ploughs. Practically all the bonemeal was sold in the Khasi and Jaintia Hills. In addition 4·6 tons of onion seeds were supplied near Noyapara in Habiganj subdivision: this was responsible for a loss of Rs. 382, but the timely supply of seed saved the onion crop of the locality. About 4 tons of *arhar* were stored in view of probable requirements, but had to be sold at a loss of Rs. 427. Temporary rural seed stores were started during the busy season in six centres and proved very useful. The Bejura seed store transacted business to the value of Rs. 4,772. The total charges for the depôt for the year under report amounted to Rs. 35,491, of which Rs. 31,373 was incurred in the purchase of seeds, manures and implements and Rs. 787 for the stores supplied from farms. The total receipts credited into the Treasury amounted to Rs. 25,784, including Rs. 324 on previous year's account. There were outstanding Rs. 2,962 at the close of the year, of which Rs. 463 has since been realized. The value of stores supplied free for experimental purposes and demonstrations and at concession rates to Honorary Correspondents amounted to Rs. 3,594 and the value of stores in hand was Rs. 9,567, including a large stock of bonemeal and jute seed which were sold in April last. The nett loss on the working of the seed depôt after allowing depreciation, establishment and contingencies, was Rs. 637.

General.

36. The work at Gauhati Seed Depôt is growing too fast and the establishment of a second depôt near Jorhat has become a matter of urgent need, which I hope will be met by a supplementary allotment in the current year. The proposal to open one farm for pulse and other *rabi* crops so that we could supply our own seeds for sale has been abandoned. In the scheme for the development of the Department submitted to Government in March last I have proposed, in its stead, at least one seed and demonstration farm for each Inspector; on these farms would be tried the suitability to the locality of results obtained on the experiment stations and they would also grow seed for local sale and distribution and would contain subsidiary seed depôts. The acceptance of this proposal would provide in all 13 seed and demonstration farms in the plains.

CHAPTER VI.

CATTLE BREEDING.

37. The policy of keeping only two distinct herds, one of pure Patna and the other of mixed Patna and Bhutia, is already showing promising results at the Upper Shillong Farm: the progeny is a distinct improvement over the old lot. The demand for the pure Patna animals still far exceeds the supply, but comes mainly from tea garden managers. The cost of maintaining the herd was Rs. 5,428 and the income was Rs. 2,230 from milk and Rs. 391 from the sale of young animals. Three breeding bulls and three heifers were sold during the year and one bull was supplied free to the Political Officer, Sadiya.

A country bull aged three years was supplied from the Rangpur farm to the Tezpur Local Board at a cost of Rs. 150. I have been informed by the Director of Agriculture, Bengal, that he cannot promise that he can supply demands from Assam for Rangpur bulls.

In the detailed scheme for the development of the Department I have proposed a cattle farm of about 300 acres to be established on Government waste land somewhere in the Kopili valley between Chaparmukh and Lumding on the Assam-Bengal Railway. From this farm bulls would be supplied, but I do not see much chance of improvement unless the people who keep cattle are educated up to castrating their inferior bulls and to feeding their cattle properly, which implies the cultivation of fodder crops. In fact the problem of cattle improvement is so full of practical difficulties arising from the communal system of grazing, the smallness of the average holding and general apathy amongst the rural population that I am afraid that results are very remote. It is more honest to say this than to encourage false hopes. As I have repeatedly reported, the demand for a better and cheaper milk supply comes from the towns; until the latter can influence the rural population to answer to that demand, we can do little. The cultivator will not adopt measures which do not appear to him to bring in immediate profit.

CHAPTER VII.

MISCELLANEOUS.

Agricultural publications and supply of information.

38. A leaflet written by the Deputy Director of Surma Valley on the preventive steps to be taken against the potato disease was published in Khasi and circulated widely among seed growers. Reports on the work of each agricultural station and seed depôt and on agricultural demonstrations were published as usual. A Handbook of reference for the officers of the Department was published at the close of the year. Honorary Correspondents were supplied free with copies of all departmental publications and reports and were given information and advice on agricultural matters. Requisitions for information relating to agriculture, particularly regarding cotton cultivation, were received in increasing numbers from private individuals and concerns and complied with.

Conference and meeting.

39. A departmental conference of the Surma Valley staff was held in August at the Karimganj farm with a view to discussing the experimental work and the demonstration programmes. A meeting of officers and influential gentlemen of the Surma Valley was held in the same month in the town of Sylhet under the presidency of the Deputy Commissioner for an informal discussion. Similar meetings were held at Nowgong and Jorhat and I hope these created some interest in our work.

As in last year, Agricultural Inspectors and Demonstrators were deputed to attend two of the principal fairs in Sylhet and Cachar, where they exhibited a collection of improved seeds, manures and implements. The Surma Valley officers attended two Social Service Exhibitions held in Sylhet and Habiganj, where considerable interest was aroused by the exhibition of seeds and manures. Two rural Agricultural Associations were tentatively started under non-official auspices at Bejura in Habiganj subdivision and Sonapur in South Sylhet: the members are mostly cultivators: they had three sittings each attended by the officers of the Department and I attended one of the meetings of the Bejura Association. We were able to introduce to the Registrar of Co-operative Societies several very promising centres for the introduction of co-operation amongst cultivators.

General Progress.

40. Towards the close of the year Messrs. Birt and Meggitt returned from leave and we had a full staff. We were able in January for the first time to post Inspectors to all the districts of the Assam Valley and by now each of the subdivisions of Sylhet is similarly provided, so that there is no part of the plains without our representatives. The Inspectors' activities are limited by the number of demonstrators, who have not yet reached half the number that I suggested as desirable in 1914: in order to prevent the Inspectors from dissipating their energies indiscriminately all over their charges, we have restricted them to groups of villages in the neighbourhood of their demonstrators' headquarters, but in these groups their propaganda will be intensive and cover as far as possible all agricultural activities, including the conservation of manure. This should ensure the establishment of centres of good results which we can multiply in the future as our staff increases.

I regret that the remarks made by me in the last annual report on our Inspectors' methods of work were as interpreted as showing that they were doing no good. Our Inspectors come from the *bhadralok* class, who are not agriculturists: but we must rely on this class for our staff as they alone are sufficiently educated to be admitted to the College. If we had, as in Europe, America and Japan an agricultural community with a reasonably high standard of education, we should of course confine our appointments mainly to that class. But we must face facts and there is no possibility of getting over the present general estimation of inferiority of the agricultural classes: hence it is but natural that at the beginning our *bhadralok* Inspectors should tend to appear superior to the people amongst whom their work lies. That tendency is, I am glad to say, disappearing. The mention of it in last year's report was intended to bring to note one of our difficulties, which is inevitable in present social conditions, but must be overcome, if we are to gain the cultivators' confidence.

The results of our work are not readily apparent to the man who does not visit the villages where we work and are not readily described in a few words. If we succeed in securing the confidence of the people by our demonstrations, they will be prepared to buy from us and the sale proceeds of our seed depôts give one tangible indication of the extent of this confidence and its growth. Here I wish to give a word of warning. It has been said to me that, as our seed depôts are so successful, we should concentrate on them and abandon our other work: this is putting the cart before the horse: the success of the seed depôts is the result of demonstrations and if we abandon the latter, the depôts will go also. Agriculturists do not ordinarily travel to Sylhet or Gauhati and order things at the depôts: their orders are given *in the villages* to our demonstrators and Inspectors. Further, we should have nothing to demonstrate unless we made experiments to produce good seeds of rice, sugarcane, potatoes and jute. Hence the sequence is (1) experiment, (2) demonstration, (3) sale. A further word of warning is that paddy seed is not sold at all: it is exchanged in the villages amongst the people: one seer of seed will produce a maund: hence once we give a 5-seer packet to one man, he and his neighbours are practically supplied with all they want. Similarly where, as in the Assam Valley, jute land is above flood level, a small portion of the crop can be kept for seed for the next year and consequently a small original supply will be enough to stock a whole village. A reference to the paragraphs regarding the sales from seed depôts will show what we sell. The amounts actually realised for the past three years are as follows:—

1918-19 (9 months)	...	Rs. 10,178 = Rs. 1,130 per month.
1919-20 (12 „)	...	Rs. 32,022 = Rs. 2,660 „ „
1920-21 (12 „)	...	Rs. 60,745 = Rs. 5,062 „ „

It will be agreed that the simple cultivator did not pay us in hard cash at the above progressive rate, culminating last year in an income of over Rs. 5,000 per month unless he had a considerable amount of confidence.

Here I had better give a final word of warning. About two-thirds of the above receipts were for iron sugarcane mills. As we supply the present demand, future needs will decrease; if the price of sugar falls, the decrease will be still greater. Hence, though I can claim that the sales indicate a proof of our progress, I am quite prepared to see a large fall in the sales in the next few years. One of the reasons for this will be the continual rise in the price of the mills owing to the demand and their manufacture being confined to Calcutta: we have been trying for the last two years to start the manufacture of these mills in the province, so far without success.

I have been connected with the Department for over nine years and reading my first annual report for 1911-12 I find that we had then a staff of one Deputy Director and two Agricultural graduates under training; work on rice was reported only in the Khasi, Naga and Lushai Hills, and was confined to terracing and the use of bonemeal in the first; work on sugarcane was confined to Sibsagar district, and 12 demonstrations of Shillong potato seed were made in Jorhat subdivision and nowhere else in the plains. Outside the two experiment stations at Jorhat and Upper Shillong there was nothing else to report. The present report is a proof at least that we have not been idle in the last nine years. The possibilities of material improvement from our department are greater than from any other, but it is the increase of the income of the man who cultivates the ground that we aim at and the method of improvement is restricted by his conditions to the improvement of his seed. That this can be a great achievement is evidenced by the claim that if we could add one maund per acre to the present average winter paddy crop in Assam of $3\frac{1}{4}$ million acres, we should, taking the value of a maund of paddy to be only one rupee per maund (*i.e.*, less half its present price), add Rs. $32\frac{1}{2}$ lacs to the annual income of the people. To do this we should require to produce better paddy seed to suit each and every district and the different localities within each district and we should need to have a staff large enough to visit every village. Without (1) the means to produce the seed by experiment and selection and (2) the demonstration staff to bring it to the notice of the cultivator, we cannot progress. We have now the nucleus for research and demonstration: what is required is expansion on our present lines. The scheme for this expansion has recently been generally approved by Government: it remains to find the cost.

Notice of services.

41. Mr. J. N. Chakravarty was appointed to the Indian Agricultural Service on 1st December last: his work as Deputy Director was good. Mr. L. Barthakur continued with success to officiate as Deputy Director in place of Mr. Birt. Maulvi Fazlal Huq Ahmed continued his successful work in the field as Superintendent in the Surma Valley and in charge of the Sylhet Seed Depôt; Babu Satyendra Chandra Datta was not alone successful in the field, but repeated his excellent record at the Gauhati Seed Depôt. Srijut. Binaram Das at Jorhat and Babu Surendra Nath Gupta at Karimganj were again efficient: the rice work of the latter is becoming too heavy and we must provide extra help soon. My Head Assistant, Babu Dinesh Chandra Das, was as usual most helpful: his handbook of reference should be of great use to our officers. Finally Mr. Hector, Botanist to the Government of Bengal, continued to give us a very helping hand and is advising our own Botanist on the lines of work.

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

APPENDIX I.

List of Honorary Correspondents of the Department of Agriculture in Assam.

SYLHET.

1. D. Ferguson, Esq., Dhamai Tea Estate, Post Office Dhakinbhag.
2. Babu Girija Nath Biswas, Post Office Baniachang.
3. „ Pavitra Nath Das, Post Office Beani Bazar.
4. „ Bidya Kumar Chowdhury, Sunamganj.
5. Maulvi Abdur Rahim Chowdhury, Zamindar, village Sultanpur, Post Office Jalalpur, Sylhet.
6. James Laurie, Esq., Post Office Naraincherra, Akbarpur, Queen Pine Apple Estate, South Sylhet.
7. Rai Sahib Joynath Nandi Mazumdar, Post Office Bejura, Habiganj.
8. Maulvi Abdul Mannan Chowdhury, Kanihati, Hazipur Post Office.
9. Maulvi Abdul Waheb, Pleader, Maulvi Bazar.

CACHAR.

10. Rai Sahib Sarala Charan Chakravarty, B. A., Assistant Inspector of Schools, Silchar.
11. Babu Bharat Chandra Das Chowdhury, Salchapra, Cachar.

KHASI AND JAINTIA HILLS.

12. U Job Solomon, Shillong.
13. U Kuhur Singh, Mylliem.
14. U MacDonald Gatphoh, Jowai.

GOALPARA.

15. Babu Dijesh Chandra Chakravarty, Manager, Gauripore Estate.
16. „ Lalit Mohan Datta, Dhubri.

KAMRUP.

17. E. P. R. Gilman, Esq., Barduar Tea Estate, Post Office Palasbari, Kamrup.
18. Munshi Tazul Islam, Sonapur, Gauhati.
19. Srijut Pratap Narain Chowdhury, Mauzadar, Khata, Nalbari.
20. „ Chandra Nath Sarma, Pandit, Post Office Palasbari.
21. Geo. Simpson, Esq., Manas Tea Estate, Sorupeta Post Office.

NOWGONG.

22. Babu Janan Chandra Ray, Baithulongso, Post Office Kampur.
23. Srijut Bhagadatta Hazarika, Mauzadar, Dharamtul Post Office.
24. „ Balaram Hazarika, Kuorital Post Office.
25. „ B. Barraclough, Esq., Lumding Post Office.

DARRANG.

26. Rai Sahib Mohidhar Bhuyan, Mauzadar, Haleswar Post Office, Tezpur.

SIBSAGAR.

27. Srijut Deveswar Sarma Barthakur, Thakurbari Farm, Post Office Haloguri.
28. „ Deveswar Gossain, Barpathar Sugarcane Farm, Post Office Badlipar (Golaghat).
29. Rai Sahib Narayan Chandra Barua, Lahing, Nakachari Post Office.
30. Srijut Sarat Chandra Goswami, Superintendent, Normal School, Post Office Jorhat.

LAKHIMPUR.

31. Srijut Pithambar Saikia, Mauzadar, Khowang, Post Office, Khowang.
32. „ Baikuntha Narayan Barua, Panitola Post Office.
33. Maulvi Zubaidali Hazarika, North Lakhimpur.

NAGA HILLS.

34. Dr. J. Riley Bailey, Mokokchang.

GARO HILLS.

35. Khan Sahib Abdul Latif, Mauzadar of Mohendraganj, Mankachar Post Office.

RANCHI.

36. Rai Bahadur Bhupal Chandra Basu, B.A., M.R.A.C., M.R.A.S.

APPENDIX II.

Statement showing the receipts and expenditure of the Department of Agriculture for the year ending the 31st March 1921.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
(*a*) Sale of manure and farm produce.	6,885 7 10	(1) Superintendence ...	90,645 10 3
(*b*) Receipts from Seed Depôts	60,745 5 3	(2) Agricultural Instruction	1,086 2 0
(*c*) Other receipts ...	8,552 13 4	(3) Agricultural Chemist ...	4,885 6 5
		(4) Experiment Stations ...	59,232 12 9
		(5) Agricultural Demonstrations and Experiments.	11,229 6 3
		(6) Seed Depôts ...	72,760 12 6
Total receipts ...	76,183 10 5	Total expenditure ...	2,39,840 2 2

APPENDIX III.

GLOSSARY.

Aus	Autumn rice.
Sail or Sali	Transplanted winter rice.
Dhaincha	Sesbania Aculeata.
Raishan	Paspalum Sanguinale.
Boro	Spring rice.
Cowpea	Vigna Catiang.
Mukhi	Colocasia antiquorum.

A. S. P. O. (D. I., R. & Agri.) No. 12—450—14-7-1921—M. C. P.

GOVERNMENT OF ASSAM.

Orders by the Governor and the Minister of Local Self-Government.

Resolution on the Report of the Department of Agriculture, Assam, for the year ending the 31st March 1921.

Extract from the Proceedings of the Government of Assam in the Local Self-Government Department, No. 243L.S.G., dated Shillong, the 1st August 1921.

READ—

The Report of the Department of Agriculture, Assam, for the year ending the 31st March 1921.

RESOLUTION.

THE sanctioned cadre of the superior staff of the Agricultural Department consists of three Deputy Directors of Agriculture, one Agricultural Chemist and one Economic Botanist, and all these posts are now filled except that of the third Deputy Director of Agriculture for which the Secretary of State is taking steps to secure a recruit. During the year under review Mr. Birt, Deputy Director of Agriculture, returned from leave and resumed charge of the Assam Valley, while Mr. J. N. Chakravarty performed the duties of Deputy Director of Agriculture for the Surma Valley and Hill Districts and was appointed to the Indian Agricultural Service with effect from the 1st December 1920. Mr. Meggitt, Agricultural Chemist, was on leave during the greater part of the year, but the staff was strengthened by the appointment of Mr. S. K. Mitra as Economic Botanist. This officer, the first of his kind in the province, took charge of his duties in March 1921. Agricultural Inspectors have now been provided for all the districts of the Assam Valley, for Cachar and the Khasi and Jaintia Hills and for each of the subdivisions of Sylhet. In addition a second Superintendent of Agriculture was sanctioned for the Assam Valley, bringing the total number up to three. A scheme for the expansion of the Department, which has recently been approved by Government subject to the provision of funds by the Legislative Council, provides for some further increase of the staff in the near future.

2. Except for the provision of scholarships at the Sabour Agricultural College and the training at the Government farms of apprentices for employment as demonstrators, the Agricultural Department confined its educational efforts to exhibiting, by means of demonstrators attached to subdivisional or smaller areas, the advantage of using selected seeds and such improved methods as have been found at the experimental farms to be successful and likely to be practical. The report shows that in this line the Department has done work of outstanding value which is thoroughly appreciated by the cultivators. Government are not however neglectful of the possibility of teaching agricultural subjects to boys in schools, but in this matter they deem it best to proceed with caution and in particular to await the results of certain experiments which are now being conducted in Bengal. In this view the Legislative Council concurred when the matter was raised during the last session.

3. At its last session the Legislative Council declined to vote supplies for the maintenance of the Shillong Fruit Station for more than six months; and steps are accordingly being taken to dispose of it. It is hoped that such arrangements will be made as will prevent the expenditure of several years and the skill and industry devoted to the experiment by Mr. C. H. Holder, the present Superintendent, from being thrown away. The three other experimental farms at Jorhat, Karimganj and Upper Shillong specialised in sugarcane, rice and potatoes respectively. Government have sanctioned the establishment of a rice experimental station for the Assam Valley and have approved of a site for it near Titabor in the Sibsagar district, subject to the voting of the necessary funds by the Legislative Council. The valuable and interesting work done on these experimental farms forms the basis of the demonstrations conducted throughout the province; and ultimately benefits the pocket of

the cultivator and the food-supply of the province through the medium of the seed depôts, the transactions of which depend on the success of the demonstrators in convincing the cultivator of the superiority of the seed tested and selected at the experimental farms. The value of the work of the Jorhat farm is shown by the fact that about 1½ lakhs of setts of selected varieties of cane were distributed during the year. The experiments at Karimganj resulted during the year in establishing the superiority of a variety of *Aus* paddy and of a variety of *Sail* paddy specially suitable for high land. Owing to an outbreak of potato disease in the Khasi and Jaintia Hills the Upper Shillong farm imported a large quantity of fresh tubers from England in order to insure a supply of disease free seed for distribution.

4. Owing to the absence on leave of the officer in charge little chemical work was effected during the year but Government have read with interest the account of the work of the Entomological Assistant in connection with the insect pests which attack paddy and other crops. It is hoped that the training of the district staff in the identification of the more common insect pests and the correct methods of control will result in the enlightenment of the cultivator as regards this most important matter.

5. The demonstration work, which as the report shows was energetically conducted, was directed mainly to showing the superiority of the selected varieties of rice, sugarcane, jute and potatoes and the advantage to be gained by the use of manure and good seed. Attempts to extend terraced rice cultivation in the Naga Hills, Lushai Hills and Sadiya Frontier Tract were also continued with varying success. A considerable increase in the number of demonstrators is provided for in the scheme for the expansion of the Department which has been referred to above.

6. It is regrettable that the efforts which have been made to find a practical means of dealing with the water-hyacinth have proved unsuccessful. For the present the connexion of the Agricultural Department with the problem is restricted to the demonstration of the use of the plant as a manure.

7. There was a most satisfactory increase in the sale of seeds, manures and implements from the two seed depôts at Gauhati and Sylhet and a proposal to open a third depôt at Jorhat has since been approved. If funds are forthcoming it is proposed to establish under each Inspector a seed and demonstration farm which will both test the applicability to the locality of results obtained at the experimental stations and grow seed for local distribution.

8. In the matter of cattle breeding the policy of keeping only two distinct herds, one of pure Patna and other of mixed Patna and Bhutia is already showing promising results at the Upper Shillong Farm. The scheme for the development of the Agricultural Department contemplates the establishment of a cattle farm in the Kopili Valley in the Nowgong district, from which farm bulls would be supplied; but Government agree with the Director of Agriculture that there is little chance of improvement until the people are brought to realise the necessity for the castration of inferior bulls and the proper feeding of their cattle.

9. The Government of Assam are much indebted to the honorary correspondents and other gentlemen mentioned in paragraph 33 of the report for the assistance which they gave to the Department. It would be hardly possible for a patriotic inhabitant of the Province to confer more lasting and solid benefits upon his fellows than by assisting in this way to popularise improved methods of agriculture amongst the cultivators. It is hoped that the number of honorary correspondents and of those who help in other ways will steadily increase.

10. Finally the Government of Assam desire to record their appreciation of the thorough and able manner in which Mr. McSwiney has continued to manage his Department, and of his interesting report; while they are indebted to the officers of the Department whose good work has been mentioned by the Director.

ORDERED that a copy of the Resolution and of the report be published in the *Assam Gazette* for general information.

By order, etc.,

A. W. BOTHAM,

Chief Secretary to the Government of Assam.

A. S. P. O. (R. & Ag.i.) No. 12—150—2-8-1921—A. E. R.

00132906

Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020